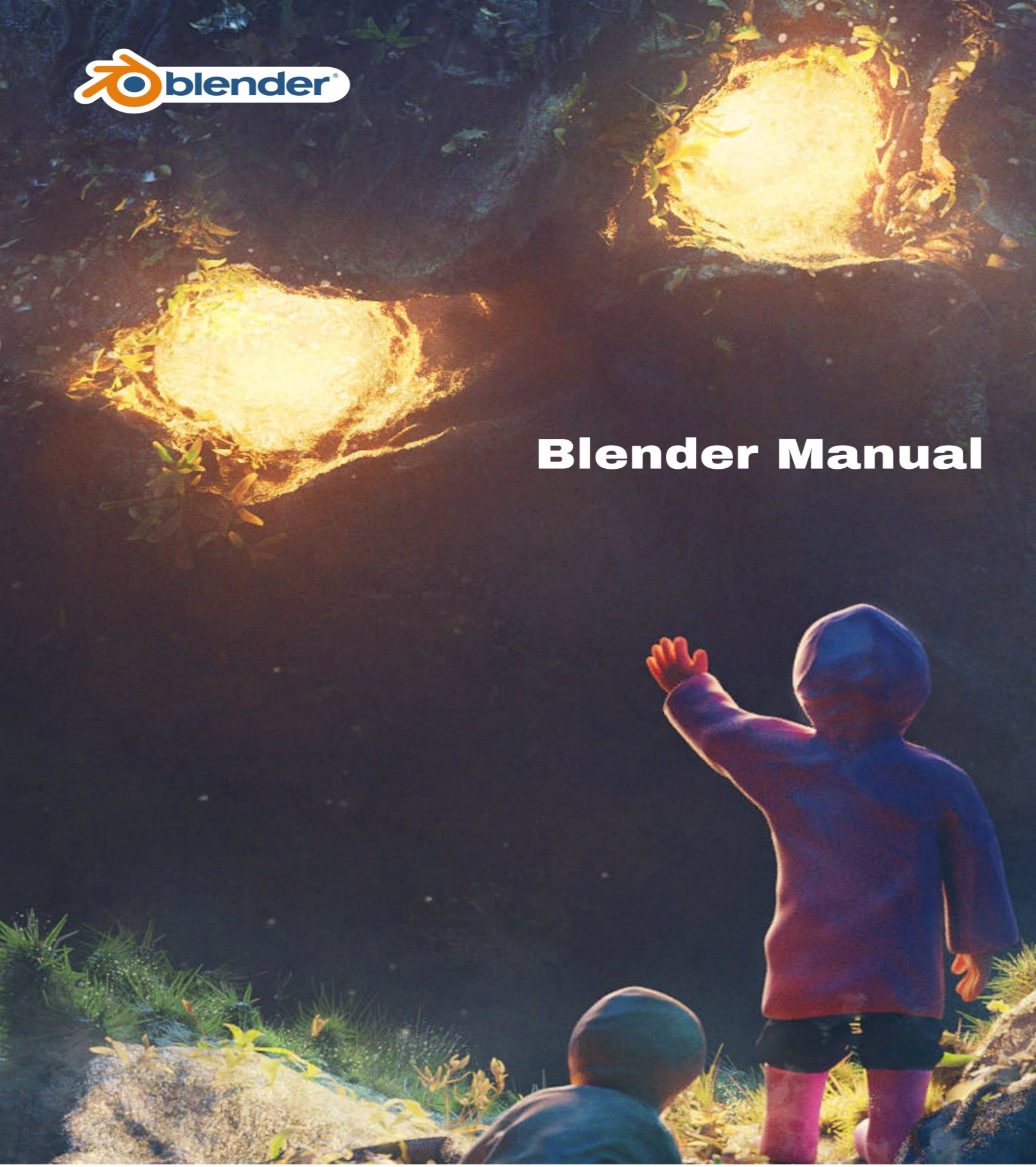

Blender Manual

Blender Documentation Team

Blender Foundation

Blender 4.3 Reference Manual

Welcome to the manual for Blender, the free and open source 3D creation suite.

Getting Started

Getting Started

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- Installing Blender
- Configuring Blender
- Help System

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Sections

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Get Involved

This manual is maintained largely by volunteers.

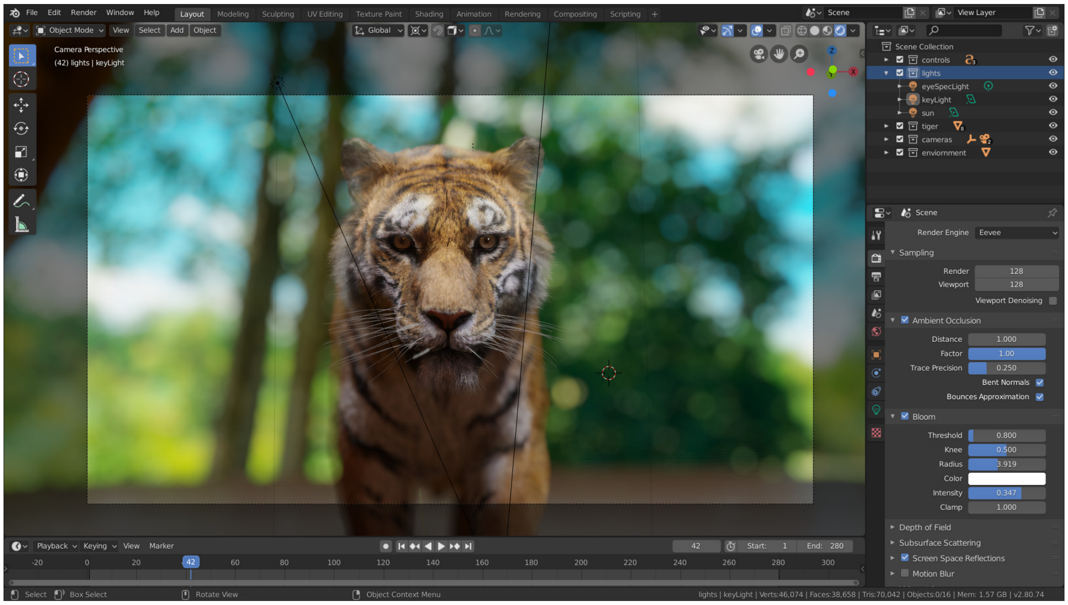
Please consider to join the effort and Contribute to this Manual.

About Blender

Welcome to Blender! Blender is a free and open-source 3D creation suite.

With Blender, you can create 3D visualizations such as still images, 3D animations and VFX shots. You can also edit videos. It is well suited to individuals and small studios who benefit from its unified pipeline and responsive development process.

Being a cross-platform application, Blender runs on Linux, macOS, as well as Windows systems. It also has relatively small memory and drive requirements compared to other 3D creation suites. Its interface uses OpenGL to provide a consistent experience across all supported hardware and platforms.


File
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Modeling
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UV Editing
Texture Paint
Shading
Animation
Rendering
Compositing
Scripting
Scene
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Object Mode
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Scene Collection
controls
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260
280
300
Select
Box Select
Rotate View
Object Context Menu

Render Engine: Eevee

Sampling

Render: 128

Viewport: 128

☐ Viewport Denoising

☑ Ambient Occlusion

Distance: 1.000

Factor: 1.00

Trace Precision: 0.250

☑ Bent Normals

☑ Bounces Approximation

☑ Bloom

Threshold: 0.800

Knee: 0.500

Radius: 3.919

Color

Intensity: 0.347

Clamp: 1.000

Depth of Field

Subsurface Scattering

☑ Screen Space Reflections

☐ Motion Blur

42 Start: 1 End: 280

lights | keyLight | Verts:46,074 | Faces:38,658 | Tris:70,042 | Objects:0/16 | Mem: 1.57 GB | v2.80.74

Who uses Blender?

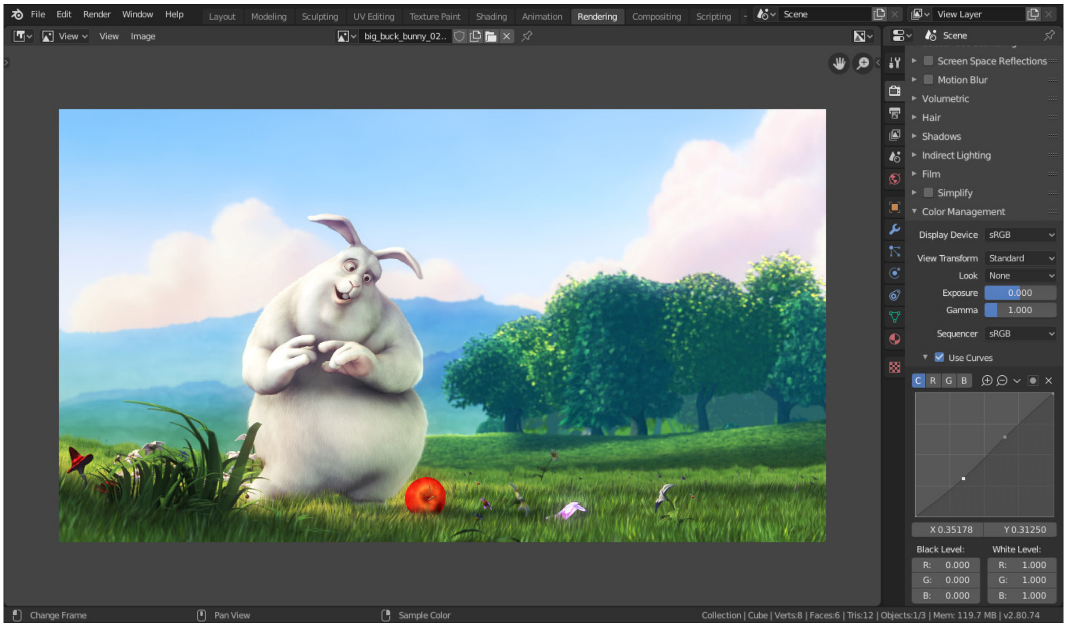
Blender has a wide variety of tools making it suitable for almost any sort of media production. Professionals, hobbyists, and studios around the world use it for creating animations, game assets, motion graphics, TV shows, concept art, story-boarding, commercials, and feature films.

Check out the User Stories page on the Blender website for more examples.

Key Features

- Blender is a fully integrated 3D content creation suite, offering a broad range of essential tools, including Modeling, Rendering, Animation & Rigging, Video Editing, VFX, Compositing, Texturing, and many types of Simulations.
- It is cross platform, with an OpenGL GUI that is uniform on all major platforms (and customizable with Python scripts).
- It has a high-quality 3D architecture, enabling fast and efficient creation workflow.
- It boasts active community support. See blender.org/community for an extensive list of sites.
- It can be installed into and run from any directory without modifying the system.

You can download the latest version of Blender here.


File
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Scene
Screen Space Reflections
Motion Blur
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Shadows
Indirect Lighting
Film
Simplify
Color Management
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Change Frame
Pan View
Sample Color

Display Device sRGB

View Transform Standard

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Exposure 0.000

Gamma 1.000

Sequencer sRGB

☑ Use Curves

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Collection | Cube | Verts:8 | Faces:6 | Tris:12 | Objects:1/3 | Mem: 119.7 MB | v2.80.74

A rendered image being post-processed.

Blender makes it possible to perform a wide range of tasks, and it may seem daunting when first trying to grasp the basics. However, with a bit of motivation and the right learning material, it is possible to familiarize yourself with Blender after a few hours of practice.

This manual is a good start, though it serves more as a reference. There are also many online video tutorials from specialized websites.

Despite everything Blender can do, it remains a tool. Great artists do not create masterpieces by pressing buttons or manipulating brushes, but by learning and practicing subjects such as human anatomy, composition, lighting, animation principles, etc.

3D creation software such as Blender have an added technical complexity and jargon associated with the underlying technologies. Terms like UV maps, materials, shaders, meshes, and “subdivs” are the media of the digital artist, and understanding them, even broadly, will help you to use Blender to its best.

So keep reading this manual, learn the great tool that Blender is, and keep your mind open to other artistic and technological areas – and you, too, can become a great artist.

Further Reading

- Blender’s History
    - Version/Revision Milestones
- About Free Software and the GPL
- The Blender Community
    - Independent Sites
    - Getting Support
    - Development
    - Chat
    - Other Useful Links

Blender's History

In 1988, Ton Roosendaal co-founded the Dutch animation studio NeoGeo. NeoGeo quickly became the largest 3D animation studio in the Netherlands and one of the leading animation houses in Europe. NeoGeo created award-winning productions (European Corporate Video Awards 1993 and 1995) for large corporate clients such as the multinational electronics company Philips. Within NeoGeo, Ton was responsible for both art direction and internal software development. After careful deliberation, Ton decided that the current in-house 3D tool set for NeoGeo was too old and cumbersome to maintain, and needed to be rewritten from scratch. In 1995 this rewrite began and was destined to become the 3D software creation we all know as Blender. As NeoGeo continued to refine and improve Blender, it became apparent to Ton that Blender could be used as a tool for other artists outside of NeoGeo.

In 1998, Ton decided to found a new company called Not a Number (NaN) as a spin-off of NeoGeo to further market and develop Blender. At the core of NaN was a desire to create and distribute a compact, cross-platform 3D application for free. At the time, this was a revolutionary concept as most commercial 3D applications cost thousands of dollars. NaN hoped to bring professional level 3D modeling and animation tools within the reach of the general computing public. NaN's business model involved providing commercial products and services around Blender. In 1999 NaN attended its first SIGGRAPH conference in an effort to more widely promote Blender. Blender's first SIGGRAPH convention was a huge success and gathered a tremendous amount of interest from both the press and attendees. Blender was a hit and its huge potential confirmed!

Following the success of the SIGGRAPH conference in early 2000, NaN secured financing of €4.5M from venture capitalists. This large inflow of cash enabled NaN to rapidly expand its operations. Soon NaN boasted as many as 50 employees working around the world trying to improve and promote Blender. In the summer of 2000, Blender 2.0 was released. This version of Blender added the integration of a game engine to the 3D application. By the end of 2000, the number of users registered on the NaN website exceeded 250,000.

Unfortunately, NaN's ambitions and opportunities did not match the company's capabilities and the market realities of the time. This over-extension resulted in restarting NaN with new investor funding and a smaller company in April 2001. Six months later NaN's first commercial software product, Blender Publisher was launched. This product was targeted at the emerging market of interactive web-based 3D media. Due to disappointing sales and the ongoing difficult economic climate, the new investors decided to shut down all NaN operations. The shutdown also included discontinuing the development of Blender. Although there were clearly shortcomings in the then current version of Blender, such as a complex internal software architecture, unfinished features and a non-standard way of providing the GUI, the enthusiastic support from the user community and customers who had purchased Blender Publisher in the past, meant that Ton could not justify leaving Blender to fade into insignificance. Since restarting a company with a sufficiently large team of developers was not feasible, Ton Roosendaal founded the non-profit organization, Blender Foundation, in March 2002.

The Blender Foundation's primary goal was to find a way to continue developing and promoting Blender as a community-based open source project. In July 2002, Ton managed to get the NaN investors to agree to a unique Blender Foundation plan to attempt to release Blender as open source. The "Free Blender" campaign sought to raise €100,000 so that the Foundation could buy the rights to the Blender source code and intellectual property rights from the NaN investors and subsequently release Blender to the open source community. With an enthusiastic group of volunteers, among them several ex-NaN employees, a fundraising campaign was launched to "Free Blender". To everyone's surprise and delight the campaign reached the €100,000 goal in only seven short weeks. On Sunday, October 13, 2002, Blender was released to the world under the terms of the GNU GPL. Blender development continues to this day, driven by a team of dedicated volunteers from around the world led by Blender's original creator, Ton Roosendaal.

Version/Revision Milestones

The start!

- **1.00 – January 1994:** Blender in development at animation studio NeoGeo.
- **1.23 – January 1998:** SGI version published on the web, IrisGL.
- **1.30 – April 1998:** Linux and FreeBSD version, port to OpenGL and X11.
- **1.3x – June 1998:** NaN founded.
- **1.4x – September 1998:** Sun and Linux Alpha version released.
- **1.50 – November 1998:** First Manual published.
- **1.60 – April 1999:** C-key (new features behind a lock, $95), Windows version released.
- **1.6x – June 1999:** BeOS and PPC version released.
- **1.80 – June 2000:** End of C-key, Blender full freeware again.
- **2.00 – August 2000:** Interactive 3D and real-time engine.
- **2.10 – December 2000:** New engine, physics, and Python.
- **2.20 – August 2001:** Character animation system.
- **2.21 – October 2001:** Blender Publisher launch.
- **2.2x – December 2001:** macOS version.

Blender goes Open Source

13 October 2002:

Blender goes Open Source, 1st Blender Conference.

2.25 – October 2002:

Blender Publisher becomes freely available, and the experimental tree of Blender is created, a coder's playground.

2.26 – February 2003:

The first truly open source Blender release.

2.27 – May 2003:

The second open source Blender release.

2.28x – July 2003:
First of the 2.28x series.

2.30 – October 2003:
Preview release of the 2.3x UI makeover presented at the 2nd Blender Conference.

2.31 – December 2003:
Upgrade to stable 2.3x UI project.

2.32 – January 2004:
A major overhaul of internal rendering capabilities.

2.33 – April 2004:
Game Engine returns, ambient occlusion, new procedural textures.

2.34 – August 2004:
Particle interactions, LSCM UV mapping, functional YafRay integration, weighted creases in subdivision surfaces, ramp shaders, full OSA, and many (many) more.

2.35 – November 2004:
Another version full of improvements: object hooks, curve deforms and curve tapers, particle duplicators and much more.

2.36 – December 2004:
A stabilization version, much work behind the scenes, normal and displacement mapping improvements.

2.37 – June 2005:
Transformation tools and widgets, soft bodies, force fields, deflections, incremental subdivision surfaces, transparent shadows, and multi-threaded rendering.

2.40 – December 2005:
Full rework of armature system, shape keys, fur with particles, fluids, and rigid bodies.

2.41 – January 2006:
Lots of fixes, and some Game Engine features.

2.42 – July 2006:
The nodes release, Array modifier, vector blur, new physics engine, rendering, lip sync, and many other features. This was the release following Project Orange.

2.43 – February 2007:
Multiresolution meshes, multi-layer UV textures, multi-layer images and multi-pass rendering and baking, sculpting, retopology, multiple additional mattes, distort and filter nodes, modeling and animation improvements, better painting with multiple brushes, fluid particles, proxy objects, Sequencer rewrite, and post-production UV texturing.

2.44 – May 2007:
The big news, in addition to two new modifiers and re-awakening the 64-bit OS support, was the addition of subsurface scattering, which simulates light scattering beneath the surface of organic and soft objects.

2.45 – September 2007:
Serious bug fixes, with some performance issues addressed.

2.46 – May 2008:
The Peach release was the result of a huge effort of over 70 developers providing enhancements to provide hair and fur, a new particle system, enhanced image browsing, cloth, a seamless and non-intrusive physics cache, rendering improvements in reflections, AO, and render baking, a Mesh Deform modifier for muscles and such, better animation support via armature tools and drawing, skinning, constraints and a colorful Action Editor, and much more. It contained the results of Project Peach.

2.47 – August 2008:
Bugfix release.

2.48 – October 2008:

The Apricot release, cool GLSL shaders, lights and GE improvements, snap, sky simulator, Shrinkwrap modifier, and Python editing improvements. This contained the results Project Apricot.

2.49 – June 2009:

Node-based textures, armature sketching (called Etch-a-Ton), Boolean mesh operation improvements, JPEG2000 support, projection painting for direct transfer of images to models, and a significant Python script catalog. GE enhancements included video textures, where you can play movies in-game, upgrades to the Bullet physics engine, dome (fisheye) rendering, and more API GE calls made available.

Blender 2.5x – The Recode!

2.5x – From 2009 to August 2011:

This series released four pre-version (from Alpha 0 in November 2009 to Beta in July 2010) and three stable versions (from 2.57 - April 2011 to 2.59 - August 2011). It was one of the most important development projects, with a total refactor of the software with new functions, redesign of the internal window manager and event/tool/data handling system, and new Python API. The final version of this project was Blender 2.59 in August 2011.

Blender 2.6x to 2.7x – Improvements & Stabilizing

2.60 – October 2011:

Internationalization of the UI, improvements in the animation system and the GE, vertex weight groups modifiers, 3D audio and video, and bug fixes.

2.61 – December 2011:

The Cycles renderer was added to the trunk, the camera tracker was added, dynamic paint for modifying textures with mesh contact/approximation, the Ocean modifier to simulate ocean and foam, new add-ons, bug fixes, and more extensions added for the Python API.

2.62 – February 2012:

The Carve library was added to improve Boolean operations, support for object tracking was added, the Remesh modifier was added, many improvements in the GE, matrices and vectors in the Python API were improved, plus new add-ons, and many bug fixes.

2.63 – April 2012:
Bmesh was merged with the trunk, with full support for n-sided polygons, sculpt hiding, a panoramic camera for Cycles, mirror ball environment textures and float precision textures, render layer mask layers, ambient occlusion and viewport display of background images and render layers. New import and export add-ons were added, and 150 bug fixes.

2.64 – October 2012:
A mask editor was added, along with an improved motion tracker, OpenColorIO, Cycles improvements, Sequencer improvements, better mesh tools (Inset and Bevel were improved), new keying nodes, sculpt masking, Collada improvements, a new Skin modifier, a new compositing nodes backend, and the fixing of many bugs.

2.65 – December 2012:
Fire and smoke improvements, anisotropic shader for Cycles, modifier improvements, the Bevel tool now includes rounding, new add-ons, and over 200 bug fixes.

2.66 – February 2013:
Dynamic topology, rigid body simulation, improvements in UI and usability (including retina display support), Cycles now supports hair, the Bevel tool now supports individual vertex beveling, new Mesh Cache modifier and the new UV Warp modifier, new SPH particle fluid solver. More than 250 bug fixes.

2.67 – May 2013:
Freestyle was added, paint system improvements, subsurface scattering for Cycles, Ceres library in the motion tracker, new custom Python nodes, new mesh modeling tools, better support for UTF-8 text and improvements in Text editors, new add-ons for 3D printing, over 260 bug fixes.

2.68 – July 2013:

New and improved modeling tools, three new Cycles nodes, big improvements in the motion tracker, Python scripts and drivers are disabled by default when loading files for security reasons, and over 280 bug fixes.

2.69 – October 2013:

Even more modeling tools, Cycles improved in many areas, plane tracking is added to the motion tracker, better support for FBX import/export, and over 270 bugs fixed.

2.70 – March 2014:

Cycles gets basic volumetric support on the CPU, more improvements to the motion tracker, two new modeling modifiers, some UI consistency improvements, and more than 560 bug fixes.

2.71 – June 2014:

Deformation motion blur and fire/smoke support is added to Cycles, UI pop-ups are now draggable. There are performance optimizations for sculpting mode, new interpolation types for animation, many improvements to the GE, and over 400 bug fixes.

2.72 – October 2014:

Cycles gets volume and SSS support on the GPU, pie menus are added and tooltips greatly improved, the Intersection modeling tool is added, new Sun Beam node for the Compositor, Freestyle now works with Cycles, texture painting workflow is improved, and more than 220 bug fixes.

2.73 – January 2015:

Cycles gets improved volumetric support, major upgrade to Grease Pencil, Windows gets Input Method Editors (IMEs) and general improvements to painting, Freestyle, Sequencer and add-ons.

2.74 – March 2015:

Support for custom normals, viewport compositing and improvements to hair dynamics.

2.75 – July 2015:

Integrated stereo/multi-view pipeline, Smooth Corrective modifier and new developmental dependency graph.

2.76 – November 2015:

Pixar OpenSubdiv support, Viewport and File Browser performance boost, node auto-offset, and a text effect strip for the Sequencer.

2.77 – March 2016:

OpenVDB support for caching of smoke/volumetric simulations, improved Cycles subsurface scattering, Grease Pencil stroke sculpting and improved workflow, and reworked library handling to manage missing and deleted data-blocks.

2.78 – September 2016:

Cycles support for spherical stereo images for VR, Grease Pencil works more similar to other 2D drawing software, Alembic import and export support, and improvements to Bendy Bones for easier and simpler rigging.

2.79 – September 2017:

New Cycles features: Denoising, Shadow catcher, and new Principled shader. Other improvements were made to Grease Pencil and Alembic. Support was also added for application templates.

Blender 2.8 – Revamped UI

2.80 – July 2019:

A totally redesigned UI for easier navigation; improved viewport, gizmos, and tools. With EEVEE a new physically based real-time render engine was created. The Grease Pencil got a big overhaul and is now a full 2D drawing and animation system. Replacing the old layers, collections are a powerful way to organize objects. Other improvements: Cycles, Modeling, Animation, Import/Export, Dependency Graph.

2.81 – November 2019:

Revamped sculpting tools, Cycles OptiX accelerated rendering, denoising, many EEVEE improvements, library overrides, UI improvements and much more.

2.82 – February 2020:
UDIM and USD support, Mantaflow for fluids and smoke simulation, AI denoising, Grease Pencil improvements, and much more.

2.83 – June 2020:
3D Viewport virtual reality scene inspection, new volume object type, Cycles adaptive sampling, Cycles viewport denoising, sculpting improvements, and much more.

Blender 2.9 – Refining 2.8

2.90 – August 2020:
Improved sky texture, EEVEE motion blur, sculpting improvements, revamped modifier UI, improved modeling tools, and faster motion blur in Cycles.

2.91 – November 2020:
Outliner improvements, property search, improved mesh Boolean operations, animation curves, volume object and display improvements, and more refined sculpting tools.

2.92 – February 2021:
Geometry nodes, primitive add tool, sculpting improvements, Grease Pencil curve editing, Cycles Color Attribute baking, APIC fluid simulations, Video Sequencer improvements, and much more.

2.93 – June 2021:
New geometry nodes, sculpting improvements, Grease Pencil Line Art modifier along with other improvements, an improved DOF for the EEVEE render engine, redesigned Cryptomatte workflow, and more.

Blender 3.0 – Optimizing Performance

3.0 – December 2021
Asset Browser added, Cycles X, EEVEE Attributes, New geometry nodes, animation update, Grease Pencil line art improvements, pose library, Open Image Denoising 2-8x faster, additional support for AMD on linux.

3.1 – March 2022
Major point clouds improvements, Cycles Apple Metal GPU support, Subdivision GPU support, image editor handles larger images, Major performance gains for geometry nodes, context aware search for geometry nodes.

3.2 – June 2022
Light groups for Cycles, true Shadow caustics, volume motion blur, GLTF improvements, AMD GPU Rendering on Linux, painting in sculpt mode, WEBp image support.

3.3 – September 2022
New hair object, procedural UV nodes, line art shadow and contour, Intel GPU rendering support via oneAPI, and improvements to library overrides.

3.4 – December 2022
Cycles path guiding, sculpting auto masking improvements, even more geometry nodes, UV Editing improvements and Wayland support on Linux.

3.5 – March 2023
New generative hair assets, vector displacement maps for sculpting, viewport compositor, and Cycle’s light trees.

About Free Software and the GPL

When one hears about "free software", the first thing that comes to mind might be "no cost". While this is often true, the term "free software" as used by the Free Software Foundation (originators of the GNU Project and creators of the GNU General Public License) is intended to mean "free as in freedom" rather than in the sense of "no cost" (which is usually referred to as "free as in free beer" or *gratis*). Free software in this sense is software which you are free to use, copy, modify, redistribute, with no limit. Contrast this with the licensing of most commercial software packages, where you are allowed to load the software on a single computer, are allowed to make no copies, and never see the source code. Free software allows incredible freedom to the end user. Since the source code is universally available, there are also many more chances for bugs to be caught and fixed.

When a program is licensed under the GNU General Public License (the GPL):

- You have the right to use the program for any purpose.
- You have the right to modify the program and have access to the source codes.
- You have the right to copy and distribute the program.
- You have the right to improve the program, and release your own versions.

In return for these rights, you have some responsibilities if you distribute a GPL'd program. These responsibilities are designed to protect your freedoms and the freedoms of others:

- You must provide a copy of the GPL with the program, so that recipients are aware of their rights under the license.
- You must include the source code or make the source code freely available.
- If you modify the code and distribute the modified version, you must license your modifications available under the GPL (or a compatible license).
- You may not restrict the licensing of the program beyond the terms of the GPL (you may not turn a GPL'd program into a proprietary product).

For more on the GPL, check its page on the GNU Project website.

Note

The GPL only applies to the Blender application and **not** the artwork you create with it; for more info see the Blender License.

The Blender Community

Being freely available from the start, even while it was closed source, considerably helped Blender's adoption by the community. A large, stable, and active community of users has gathered around Blender since 1998. The community showed its support for Blender in 2002 when they helped raise €100,000 in seven weeks to enable Blender to go Open Source under the GNU GPL License.

Independent Sites

There are several independent websites such as forums, blogs, news, and tutorial sites dedicated to Blender.

One of the largest community forums is Blender Artists, where Blender users gather to show off their creations, get feedback, ask and offer help and, in general, discuss Blender.

Getting Support

Blender's community is one of its greatest features, so apart from this user manual, there are many different ways to get support from other users, such as Chat, Stack Exchange, and Reddit.

For studios and organizations there is Enterprise support, and for studios looking to add Blender to their pipeline, Blender Studio contains documentation and training material around this topic. If you think you have found an issue with Blender, please report a bug.

More details about support can be found on the support page.

Development

Being open source, Blender welcomes development from volunteers. Communication between developers is done mostly through three platforms:

- The projects.blender.org system
- Developer Forum
- Online Chat (see below)

If you are interested in helping develop Blender, see the Get Involved page.

Chat

For real-time discussion, we have chat.blender.org which uses Blender ID for authentication.

You can join these channels:

- #general For general chat with the community.
- #blender-coders For developers to discuss Blender development.
- #python For support for developers using the Python API.
- #docs For discussion related to Blender's documentation.

Other Useful Links

- Blender FAQ (Can I use Blender commercially? What is GPL/GNU? …)
- Demo and benchmark files
- Developer's Ask Us Anything!

Installing Blender

Blender is released approximately every three months. You can keep up to date with the latest changes through the release notes.

System Requirements

Blender is available for download on Windows, macOS, and Linux. Always check that the graphics drivers are up to date and that OpenGL is well supported. Blender has a set of minimum and recommended requirements; so make sure these are met before trying to install Blender.

Support for other hardware such as graphic tablets and 3D mice are covered later in Configuring Hardware.

Download Blender

Blender offers a variety of different binary packages to choose from depending on their level of stability. Each package has the trade off of newest feature versus stability. The package that is right for you depends on your requirements for those two. A studio for example might want to have *long-term support*, while a hobbyist may want newer features, while others may just want to test upcoming features. Each package described below has something just right for everyone.

Stable Release

A package that contains the latest features and is considered stable without regressions. A new stable version is available about every three months.

Long-term Support

A package designed for long-lasting projects requiring a very stable version of Blender. LTS releases are supported for two years and will not have any new features, API changes or improvements. A new long-term support version is available every year.

Daily Builds

A package updated daily to include the newest changes in development. These versions are not as thoroughly tested as the stable release, and might break, although they are official and usually not highly experimental.

Note

Blender’s source code is available for free to either reference or to Build from Source. While normal users are **not** expected to compile Blender, it does have advantages:

- Blender is always up to date.
- It allows access to any version or branch where a feature is being developed.
- It can be freely customized.

The procedure for installing a binary, either the latest stable release or a daily build, is the same. Follow the steps for your platform.

Note

Blender doesn’t have a built-in updating system. This means you will need to update Blender yourself by following the upgrade steps described in the sections below.

Installation Guides

- Installing on Linux
- Installing on macOS
- Installing on Windows
- Installing from Steam

Installing on Linux

Check the Downloading Blender page to find the minimum requirements and the different versions that are available for Blender (if you have not done so yet).

Install from blender.org

Download the Linux version for your architecture and decompress the file to the desired location (e.g. `~/software` or `/usr/local`).

Blender can now be launched by double-clicking the executable.

When using this method of installation, it is possible to have multiple versions of Blender installed.

For ease of access, you may wish to add a menu entry and create blend-file associations for the file-browser. This can be done by Registering Blender.

To make the installation and configuration fully self-contained, set up a Portable Installation.

Install from Package Manager

Some Linux distributions may have a specific package for Blender in their repositories.

Installing Blender via the distribution's native mechanisms ensures consistency with other packages on the system and may provide other features (given by the package manager), such as listing of packages, update notifications and automatic menu configuration. Be aware, though, that the package may be outdated compared to the latest official release, or not include some features of Blender. For example, some distributions do not build Blender with Cycles GPU rendering support, for licensing or other reasons.

If there is a specific package for your distribution, you may choose what is preferable and most convenient, otherwise, the official binary is available on blender.org.

Install from Snap

Snap is a universal package manager designed to work across a range of distributions. Assuming snap is already installed, Blender can be installed through snap with:

```
snap install blender --classic
```

Installing from this method has a benefit that updates to Blender are automatically installed. Blender from Snap should have a more consistent distribution then individual package managers.

Running from the Terminal

See Launching from the terminal.

Graphics System (X11 & Wayland)

Blender supports both X11 and Wayland, see Linux Windowing Environment for details.

Avoiding Alt-Mouse Conflict

Some window managers default to `Alt-LMB` and `Alt-RMB` for moving and resizing windows.

Blender uses these for various operations, notably:

- Emulate 3 Button Mouse.

- Select Edge Loops.
- Changing multiple properties at once.

To access Blender's full feature set, you can change the window manager settings to use the *Meta* key instead (also called *Super* or *Windows* key):

Gnome

Enter the following in a command line (effective at next login):

```
gsettings set org.gnome.desktop.wm.preferences mouse-button-
modifier '<Super>'
```

KDE

System Settings ▸ *Window Management* ▸ *Window Behavior* ▸ *Window Actions*, Switch from 'Alt' to 'Meta' key.

Updating on Linux

On Linux there are various ways of updating Blender. This section covers the most common approaches.

Updating from blender.org

When an update for Blender is released, it can be downloaded directly from the Blender website and installed using the steps described in the section Install from blender.org.

Updating with a Package Manager

Many Linux distributions have packages for Blender available, which can be installed using the distribution's package manager. After installation, Blender can be updated using the same steps as updating any other application.

See also

The Splash screen Defaults page for information about importing settings from previous Blender versions and other quick settings.

Known Limitations

Archive Extraction

Extracting Blender’s archive using **7-zip** is not supported. TAR must be used instead, see: #104070.

Installing on macOS

Check the Downloading Blender page to find the minimum requirements and the different versions that are available for Blender (if you have not done so yet).

Important

Blender supports both Intel and Apple Silicon architectures on macOS. Make sure to download a variant that is compatible with your CPU’s architecture.

Install from DMG

Blender for macOS is distributed as disk images (dmg-files). To mount the disk image, double-click on the dmg-file. Then drag `Blender.app` into the Applications folder.

Depending on the Security and Privacy preferences of your Mac, macOS will request your approval before opening Blender for the first time.

To make the installation and configuration fully self-contained, set up a Portable Installation.

Updating on macOS

On macOS there are various ways of updating Blender. This section covers the most common approach.

Updating with DMG

When an update for Blender is released, it can be downloaded directly from the Blender website. Install the new version by overwriting the current

`Blender.app` in the Applications folder. You can rename `Blender.app` or place it in a different folder to have more than one version at a time.

See also

The Splash screen Defaults page for information about importing settings from previous Blender versions and other quick settings.

Installing on Windows

Check the Downloading Blender page to find the minimum requirements and the different versions that are available for Blender (if you have not done so yet).

Download the zip-file or Windows Installer File.

Important

Blender supports both x64 and arm64 architectures on Windows. Make sure to download a variant that is compatible with your CPU’s architecture.

Install from Windows Installer File

The Windows installer will let you choose an installation folder, and will create an entry in the start menu as well as associate blend-files with Blender. It requires administrator rights.

Install from Zip

When choosing the zip-file, you have to manually extract Blender to the desired folder, where you can double-click the executable to run Blender.

No start menu item will be created and no blend-file association will be registered, but there is also no need for administrator rights. You can register the file association manually by clicking *Make Default* on the System tab of the Preferences. Alternatively, you can run `blender -r` from the Command Line.

To make the installation and configuration fully self-contained, set up a Portable Installation.

Install from Microsoft Store

Blender can be installed from the Microsoft Store by searching for Blender in the Microsoft Store and installing it.

Blender can now be launched from the Windows Start menu.

Updating on Windows

On Windows there are various ways of updating Blender. This section covers the most common approaches.

Updating from Windows Installer File

When an update for Blender is released, it can be downloaded directly from the Blender website. The Windows installer can then be run to install the updated version of Blender. To remove a previously installed version of Blender, use Windows settings or control panel to uninstall the desired version.

Updating from Zip

When an update for Blender is released, it can be downloaded directly from the Blender website and extracted to the desired folder, where you can double-click the executable to run Blender. For more information on creating a portable version of Blender, see the section Install from Zip.

Note, you do not have to overwrite your existing Blender installation. It's perfectly possible to have multiple versions installed side by side.

Updating from the Microsoft Store

When an update for Blender is available on the Microsoft Store, it will be downloaded and installed automatically.

See also

The Splash screen Defaults page for information about importing settings from previous Blender versions and other quick settings.

Installing from Steam

Steam is a software distribution platform. Blender can be downloaded and updated using the Steam client by following the steps described below on Linux, macOS, or Windows.

Download the Steam client for your operating system. Once installed, open the client and login to your Steam account, or create one if you haven't already. Once logged in, navigate to the *Store* tab, search for "Blender", and press the green installation button. Blender should now be available in the *Library* tab of the Steam client.

See also

When installing Blender from Steam on Linux and Windows, the `.blend` filename extension will not be automatically associated with Blender. To associate blend-files with Blender, see the processes described on the Linux and Windows installation pages.

Updating with Steam

When an update for Blender is available on Steam, Steam will automatically update Blender for you.

Linux Windowing Environment

On Linux Blender supports both X11 and Wayland for official releases.

When Wayland is detected, it is the preferred system, otherwise X11 will be used.

Hint

The current “Windowing Environment” is listed in *File* ‣ *About*.

X11

This is the windowing environment that has been used most widely on Linux & Unix systems.

There are no near-term plans to deprecate or remove X11 support.

Wayland

Support for Wayland is a more recent addition, so there may be configurations that have not been tested yet. Please report a bug if you experience problems.

Blender has been tested with Gnome-Shell (mutter), KDE (plasma) & SWAY (wlroots) based compositors.

Requirements

Gnome-Shell

Under Gnome-Shell the `libdecor` library is required. This is available as a package on most Linux distribution.

If the library isn't found X11 will be used as a fallback.

Troubleshooting

Detailed Wayland output can help to track down problems. Launch Blender from the command-line with additional arguments:

Blender's Wayland Logging

```
blender --log "ghost.wl.*" --log-level 2
```

Wayland Built-In Logging

```
WAYLAND_DEBUG=1 blender
```

Disable Wayland (forcing X11)

```
WAYLAND_DISPLAY="" blender
```

Disable `libdecor` (forcing borderless windows under Gnome-Shell)

Uninstall `libdecor`, then run Blender with an empty X11 display variable.

```
DISPLAY="" blender
```

Environment Variables

`XCURSOR_THEME`

The cursor theme to use (must refer to a locally installed cursor).

`XCURSOR_SIZE`

The cursor size, defaults to 28, you may wish to increase the size on Hi-DPI displays.

Known Limitations

Gnome Shell's Fractional Scaling (before version 44)

Versions of Gnome-Shell prior to 44 don't fully support fractional scaling.

Using fractional under older versions of Gnome-Shell may result in glitches such as a small cursor size.

NVidia GPU

Currently NVidia drivers don’t fully support features needed for Wayland. Graphical glitches and flickering are common problems. In some cases, there can be crashes on startup. This is not specific to Blender, so NVidia users may want to use X11 until driver support improves.

Feature Comparison

Feature	X11	Wayland	Notes
Smooth Scroll	✗	✓	Smooth scrolling with track-pads.
Multi-Touch Gestures	✗	✓	Track-pad and tablet support for pinch to zoom, pan and orbit.
Reliable Cursor Warping	✗ *1	✓	Cursor warping is used while transforming and orbiting the viewport for e.g.
Window Positioning	✓	✗ *2	Needed for dragging between windows and restoring window positions on file load.

Other features which both systems support such as Hi-DPI, 3D-mouse, tablet input, … etc. have been left out of this list.

[*1] In X11 fast cursor motion may exit the window bounds while the cursor is grabbed (transforming for e.g.).

[*2] Wayland doesn’t support setting the window position, as this is a design decision it’s unlikely to be supported (see issues for position).

Configuring Blender

- Introduction
    - Language
    - Input
    - File and Paths
    - Save & Load
- Configuring Peripherals
    - Displays
    - Input Devices
    - Head-Mounted Displays (Virtual Reality)
- Defaults
    - Import Preferences From Previous Version
    - Create New Preferences
    - Saving Defaults
    - Loading Factory Settings

See also

See Preferences for a complete list of options.

Introduction

Here are some preferences that you may wish to set initially. See the section Preferences for the complete list of available settings.

Language

Enable *Edit* ‣ *Preferences* ‣ *Interface* ‣ *Translation*, and choose the *Language* and what to translate from *Interface*, *Tooltips* and *New Data*.

See Language for details.

Input

If you have a compact keyboard without a separate number pad, enable *Preferences* ‣ *Input* ‣ *Keyboard* ‣ *Emulate Numpad*. This gives you the 3D view shortcuts regularly used on the number pad.

If you do not have a middle mouse button, you can enable *Preferences* ‣ *Input* ‣ *Mouse* ‣ *Emulate 3 Button Mouse*. This allows you to hold the `Alt` or `OSKey` key while dragging with the mouse, to orbit.

See Input Preferences for details.

File and Paths

At *Preferences* ‣ *File Paths* you can set options such as what *Image Editor* (GIMP, Krita…) and *Animation Player* to use.

The Temporary Directory sets where to store files such as temporary renders and auto-saves.

Tip

The `//` at the start of each path in Blender means the directory of the currently opened blend-file, used to reference relative paths.

See File Preferences for details.

Save & Load

If you trust the source of your blend-files, you can enable *Auto Run Python Scripts*. This option is meant to protect you from malicious Python scripts in blend-files that you got from someone else. Many users turn this option on, as advanced rigs tend to use scripts of some sort.

See Save & Load Auto Run Python Scripts Preference.

Configuring Peripherals

Displays

A full HD display or higher is recommended. Multi-monitor setups are supported, and workspaces can be configured to span multiple monitors.

Example of Blender’s multi-monitor support.

Input Devices

Blender supports various types of input devices:

- Keyboard (recommended: keyboard with numeric keypad, English layout works best)
- Mouse (recommended: three button mouse with scroll wheel)
- Graphic Tablet
- Touchpad
- NDOF Device (also known as *3D Mouse*)

Note

> If you don’t have a middle mouse button or numpad, you can emulate these in the Input Preferences.

Mouse

Mouse Button Emulation

If you do not have a 3 button mouse, you will need to emulate it by checking the option in the Preferences.

The following table shows the combinations used:

3-button Mouse	`LMB`	`MMB`	`RMB`
2-button Mouse	`LMB`	`Alt-LMB`	`RMB`

Keyboard

Numpad Emulation

If you do not have a numpad on the side of your keyboard, you may want to emulate one. You can then use the number row at the top of the keyboard instead, but will no longer have access to these keys’ original functions (such as switching between vertex/edge/face selection in Edit Mode).

> **See also**
>
> Read more about *Numpad Emulation* in the Preferences.

Non-English Keyboards

If you use a keyboard with a non-English layout, you may still benefit from switching to the UK or US layout while working with Blender.

Note

You can also change the keymap from the Preferences. However, this manual assumes you are using the default keymap.

Graphic Tablet

Graphics tablets can be used to provide a more traditional method of controlling the mouse cursor using a pen. This can help provide a more familiar experience for artists who are used to painting and drawing with similar tools, as well as provide additional controls such as pressure sensitivity.

Note

If you are using a graphic tablet instead of a mouse and pressure sensitivity does not work properly, try to place the mouse pointer in the Blender window and then unplug/replug your graphic tablet. This might help.

Touchpad

Touchpad controls are available on Windows, macOS and Linux with Wayland. If you are working from a laptop without a mouse, you can emulate controls using multi-touch gestures with the trackpad from Preferences.

Supported multi-touch gestures

Gesture	Effect

Gesture	Effect
Pan	Hold the `Shift` key while dragging two fingers on the pad.
Zoom	Hold the `Ctrl` or `OSKey` key while dragging two fingers on the pad.
Orbit	Drag two fingers on the pad.
Emulate right-click	Tap two fingers on the pad.

NDOF (3D Mouse)

3D mice or NDOF devices are hardware that you can use to navigate a scene in Blender. Currently only devices made by 3Dconnexion are supported. These devices allow you to explore a scene, and make Fly/Walk Navigation easier to control. The NDOF device can be configured in the Preferences. These settings can also be accessed directly from the viewport using the `NDOFMenu` button on the NDOF device.

See also

See Input Preference for more information on configuring peripherals.

Head-Mounted Displays (Virtual Reality)

HMDs make it possible to place users in an interactive, virtual environment. Attached to the head, they track head movements to project a seemingly surrounding world onto small screens in front of the user’s eyes. If the system works well, they experience the virtual environment as if they were really inside of it.

Supported Platforms

Virtual reality support in Blender is implemented through the multi-platform OpenXR standard. This standard is new and therefore support for it is still limited.

OpenXR compatible platforms.

Platform	Operating System	Notes
HTC Vive Cosmos	Windows	Developer Preview
HTC Vive Focus 3	Windows	Developer Preview
Monado	GNU/Linux	*Not* recommended for general use yet.
Meta (formerly Oculus) (Rift and Quest)	Windows	Requires Oculus v31 Software Update. Oculus Link required for Quest.
SteamVR	Windows, GNU/Linux	Requires SteamVR 1.16 or greater.
Varjo	Windows	–

Platform	Operating System	Notes
Windows Mixed Reality	Windows	Requires Windows 10 May 2019 Update (1903).

Getting Started

The following subsections describe how an HMD can be set up for usage with the supported platforms. If this is not done, Blender will report an error when trying to start a virtual reality session.

HTC Vive Cosmos

The dedicated platform for the HTC Vive Cosmos is currently targeted at developers and may lack features found in other platforms.

- Follow the steps from the Vive Developer Forums.
- Enable the VR Scene Inspection add-on in Blender.

HTC Vive Focus 3

The dedicated platform for the HTC Vive Focus 3 is currently targeted at developers and may lack features found in other platforms.

- Follow the steps from the Vive Developer Forums.
- Enable the VR Scene Inspection add-on in Blender.

Monado

Monado is a free and open source XR platform for Linux. It is not yet ready for production usage and should only be used for testing purposes.

- Packages are available for the following distributions:

  - Ubuntu (Eoan, Focal)
  - Debian (bullseye, sid)

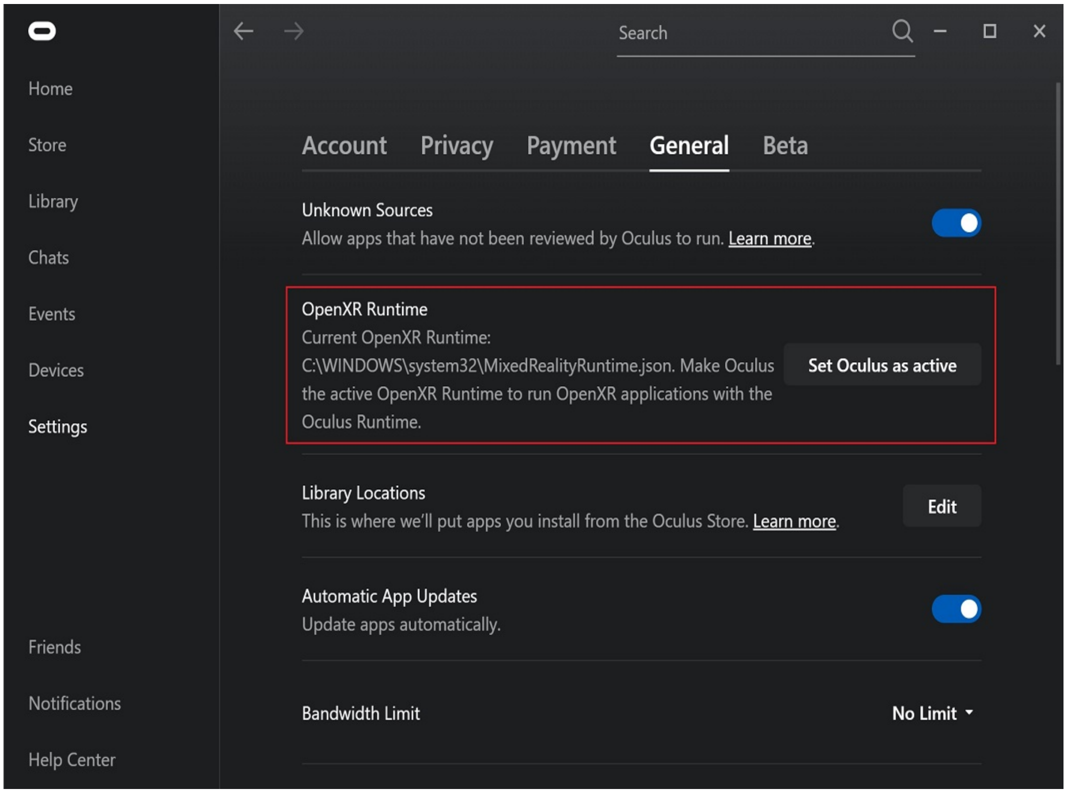
  For other systems, it has to be compiled from source, which in this case is not recommended for people with little experience in compiling software. Follow the Getting Started Guides from Monado to do so nevertheless.

- Enable the VR Scene Inspection add-on in Blender.

Meta (formerly Oculus)

Meta (formerly Oculus) provides full support for OpenXR as of the Oculus v31 Software Update.

- Download and install the Oculus Rift/Oculus Link software.
- Set Oculus as the active OpenXR runtime via the *General* tab in the Oculus App Settings.


Home
Store
Library
Chats
Events
Devices
Settings
Friends
Notifications
Help Center
Search
Account
Privacy
Payment
General
Beta
Set Oculus as active
Edit
No Limit

Unknown Sources
Allow apps that have not been reviewed by Oculus to run. Learn more.

OpenXR Runtime
Current OpenXR Runtime: C:\WINDOWS\system32\MixedRealityRuntime.json. Make Oculus the active OpenXR Runtime to run OpenXR applications with the Oculus Runtime.

Library Locations
This is where we'll put apps you install from the Oculus Store. Learn more.

Automatic App Updates
Update apps automatically.

Bandwidth Limit

- Enable the VR Scene Inspection add-on in Blender.

Passthrough Support

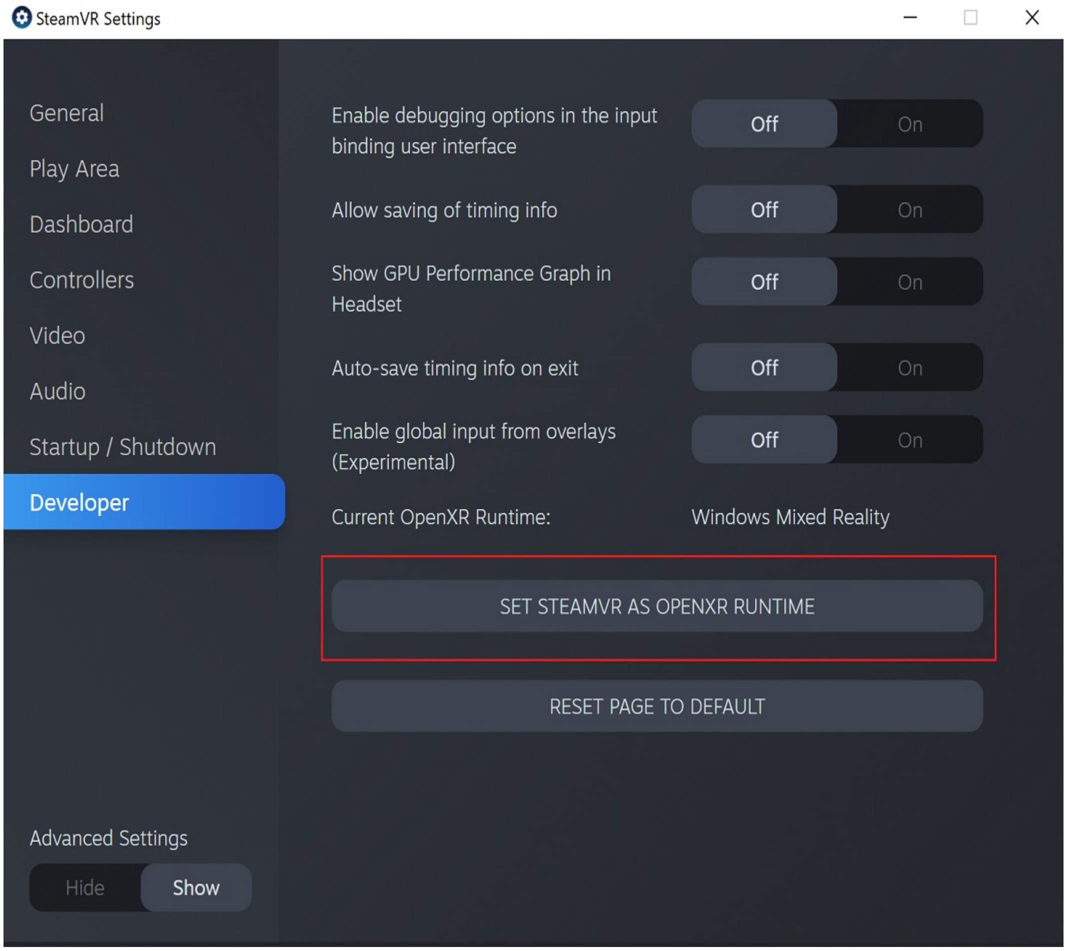
Currently, passthrough support over OpenXR is disabled by default in the Quest Link app, and must be manually enabled in it’s settings to use this feature.

The performance of the passthrough render varies with the quality of the connection between the headset and the computer. For better results, connecting the headset directly through USB to the PC, or at least connecting the computer to the local network over ethernet, is recommended.

SteamVR

SteamVR provides full support for OpenXR as of SteamVR 1.16.

- Set SteamVR as the active OpenXR runtime via the *Developer* tab in the SteamVR Settings.


SteamVR Settings
General
Play Area
Dashboard
Controllers
Video
Audio
Startup / Shutdown
Developer
Advanced Settings
Hide
Show
SET STEAMVR AS OPENXR RUNTIME
RESET PAGE TO DEFAULT

Enable debugging options in the input binding user interface: Off

Allow saving of timing info: Off

Show GPU Performance Graph in Headset: Off

Auto-save timing info on exit: Off

Enable global input from overlays (Experimental): Off

Current OpenXR Runtime: Windows Mixed Reality

- Enable the [VR Scene Inspection add-on](#) in Blender.

Note

The SteamVR runtime can also be used for HTC Vive Cosmos, Oculus, and Windows Mixed Reality HMDs.

Varjo

[Varjo](#) includes full OpenXR support with its required Varjo Base software.

- Enable the [VR Scene Inspection add-on](#) in Blender.

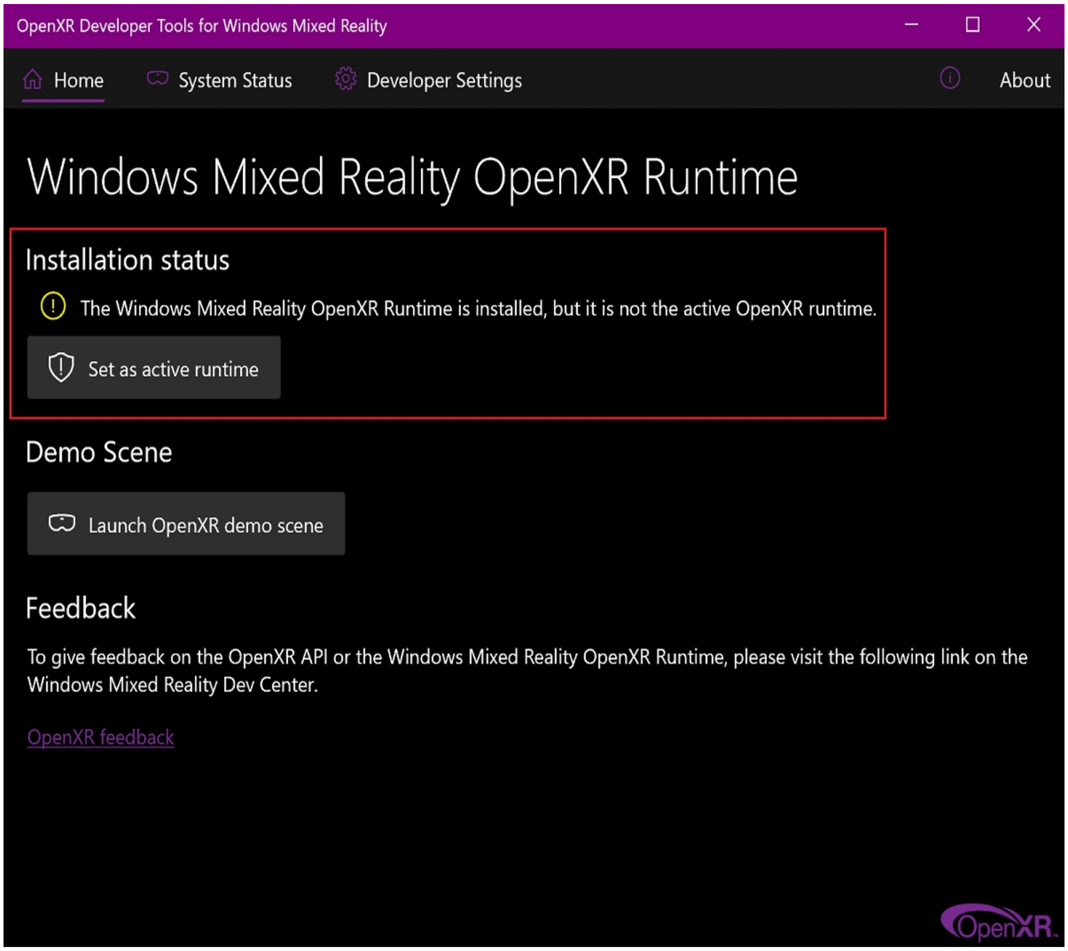
Windows Mixed Reality

Windows Mixed Reality provides full support for OpenXR. To check if a PC meets the requirements to run the software, Microsoft offers the Windows Mixed Reality PC Check application.

- Make sure the Windows 10 May 2019 Update (1903) is installed.
- If the system meets all requirements, the Mixed Reality Portal should already be installed. It is also available in the Microsoft Store.
- Launch the Mixed Reality Portal. Click the menu button `...` in the lower left corner. In the menu it opens, select the *Set up OpenXR*.
- Enable the VR Scene Inspection add-on in Blender.

Note

To switch to Windows Mixed Reality from another OpenXR runtime (e.g. SteamVR), download the OpenXR Developer Tools from the Microsoft Store and set Windows Mixed Reality as the active runtime.


OpenXR Developer Tools for Windows Mixed Reality
Home
System Status
Developer Settings
About

Windows Mixed Reality OpenXR Runtime

Installation status

The Windows Mixed Reality OpenXR Runtime is installed, but it is not the active OpenXR runtime.

Set as active runtime

Demo Scene

Launch OpenXR demo scene

Feedback

To give feedback on the OpenXR API or the Windows Mixed Reality OpenXR Runtime, please visit the following link on the Windows Mixed Reality Dev Center.

OpenXR feedback

OpenXR

Defaults

When you start Blender for the first time or update to a new version, the interactive region of the Splash Screen is replaced with a couple of initial preferences to configure how you interact with Blender.

Note

These options can always be changed later in the Preferences.

Import Preferences From Previous Version

This is where you can copy preferences from an older version of Blender. Doing so will copy preferences and startup files from the previous version of Blender and then loads them.

The preferences need to be imported from previous versions because the configuration files of each Blender version are stored in separate folders. Refer to the Blender's Directory Layout page for the location of these folders.

If you would like to start fresh with the new version, continue to Create New Preferences.

Create New Preferences

Language

The language used in the user interface. The list is broken up into categories determining how complete the translations are. More language preferences can be set in the Translation Preferences.

Theme

Choose between a light or dark theme for Blender. Themes can be customized more in the Preferences.

Keymap

Presets for the default keymap for Blender. Note that this manual assumes that you use the “Blender” keymap.

Blender::	This is the default keymap. Read more about this keymap here.
Blender 2.7x::	This keymap is intended to match an older series of Blender versions and is designed for people upgrading who do not want to learn the updated keymap.
Industry Compatible::	This keymap is intended to match common creation software and is intended for people who use many different such applications. Read more about this keymap here.

Mouse Select

Controls which mouse button, either right or left, is used to select items in Blender.

Spacebar Action

Controls the action of `Spacebar`. These and other shortcuts can be modified in the keymap preferences.

Play::	Starts playing through the Timeline. This option is good for animation or video editing.
Tools::	Opens the Toolbar underneath the cursor to quickly change the active tool. This option is good if doing a lot of modeling or rigging.
Search::	Opens up the Menu Search. This option is good for someone who is new to Blender and is unfamiliar with its menus and shortcuts.

Save New Preferences

Saves the preferences set above and opens the regular Splash Screen.

Saving Defaults

The preferences are automatically saved when changed.

Changing the default startup file can be done via *File* ‣ *Defaults* ‣ *Save Startup File*. See Startup File.

There are two areas where Blender's defaults are stored:

Preferences
: The Preferences file stores keymap, add-ons theme and other options.

Startup File
: The Startup File stores the scene and UI setup which are displayed at startup and when creating a new file (*File* ‣ *New*).

Loading Factory Settings

You can revert your customizations to Blender's defaults:

Preferences
: The Preferences Load Factory Settings.

Startup File & Preferences
: *File* ‣ *Defaults* ‣ *Load Factory Settings*.

Note

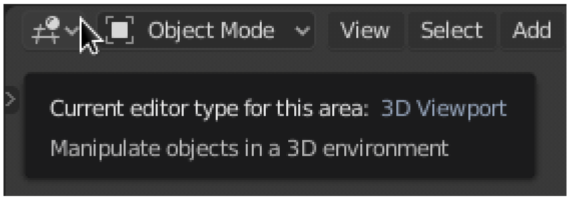
After loading the factory settings, the preferences won't be auto-saved.

See Managing Preferences for details.

Help System

Blender has a range of built-in and web-based help options.

Tooltips



Current editor type for this area: 3D Viewport
Manipulate objects in a 3D environment

Tooltip of the Renderer selector in the Info Editor.

When hovering the mouse cursor over a button or setting, after a few instants a tooltip appears.

Elements

The context-sensitive Tooltip might contain some of these elements:

Short Description
: Related details depending on the control.

Shortcut
: A keyboard or mouse shortcut associated to the tool.

Value
: The value of the property.

: Hovering over a color property will display a large swatch preview of the color and the color's hexadecimal, RGBA, and HSVA values.

Library
: Source file of the active object. See also Linked Libraries.

Disabled (red)

The reason why the value is not editable.

Python

When Python Tooltips are enabled, a Python expression is displayed for scripting (usually an operator or property).

Context-Sensitive Manual Access

Reference

Mode::	All modes
Menu::	*Context menu* ‣ *Online Manual*
Shortcut::	`F1`

You may want to access help for a tool or area from within Blender.

To do so; hover the cursor over the tool or button you need help with and use the keyboard shortcut or context menu item to visit pages of this reference manual from within Blender. This opens a web page relating to the button under the cursor, supporting both tool and value buttons.

Note

We do not currently have 100% coverage. You may see an alert in the info header if a tool does not have a link to the manual.

Other times, buttons may link to more general sections of the documentation.

Help Menu

Web Links

The first options of this menu provide direct links to Blender-related websites. The same links can also be found in the Splash Screen.

Manual
: This is a link to the Official Blender Manual (which you are now reading).

Release Notes
: Link to the release notes for the current Blender version.

Tutorials
: Multiple tutorials to help you learn to use Blender.

Support
: Links to various sites, providing both community and professional support.

User Communities
: Lists of many different community sites and support venues.

Report a Bug
: The Blender Bug Tracker (registration needed).

Save System Info

This extracts system information which can be useful for including in bug reports, inspecting the configuration, or diagnosing problems.

You will be prompted to save a text file called `system-info.txt`.

It contains the following sections:

Blender
: This section shows you the Blender version, details about the build configuration, and the path in which Blender is running.

Python

The version and path of your Python installation.

Directories

Paths used for scripts, data files, presets and temporary files.

Those directories are configured using the Preferences Editor.

GPU

Shows the GPU vendor, version and the capabilities of your hardware and driver.

Enabled Add-Ons

Lists add-ons currently in use.

User Interface

- Window System
  - Introduction
  - Splash Screen
  - Topbar
  - Workspaces
  - Status Bar
  - Areas
  - Regions
  - Tabs & Panels
- Keymap
  - Common Shortcuts
  - Default Keymap
  - Industry Compatible Keymap
- UI Elements
  - Buttons
  - Input Fields
  - Menus
  - Eyedropper
  - Decorators
  - Data-Block Menu
  - List View
  - Color Picker
  - Color Ramp Widget
  - Color Palette
  - Curve Widget
- Tools & Operators
  - Tool System
  - Operators
  - Undo & Redo
  - Annotations
  - Selecting
- Nodes
  - Introduction

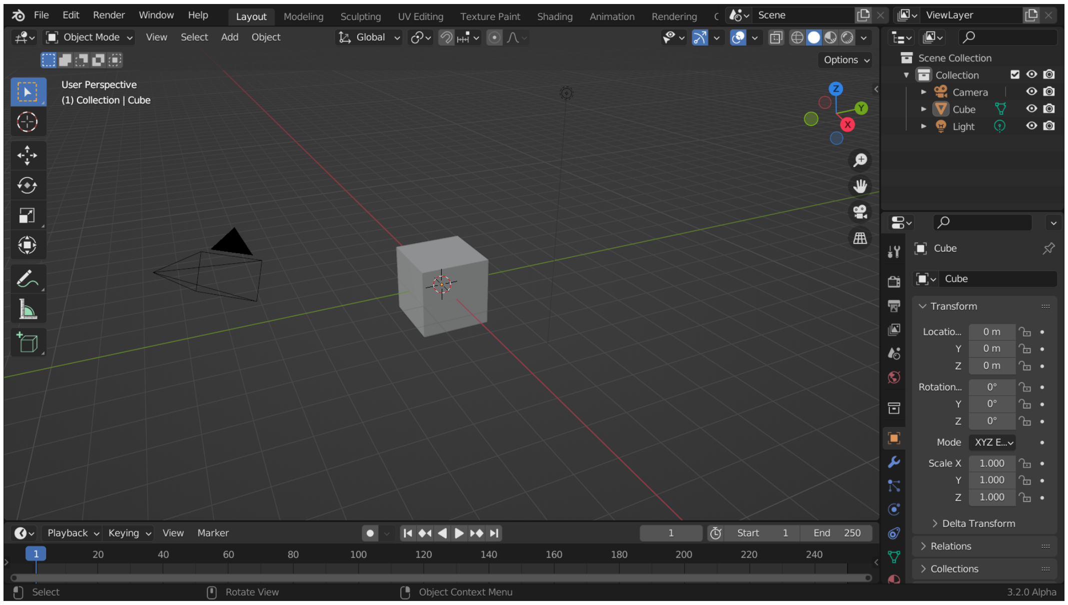
- Node Parts
- Selecting
- Arranging Nodes
- Editing
- Sidebar
- Node Groups
- Frame Node
- Reroute Node

Window System

- Introduction
- Splash Screen
- Topbar
- Workspaces
- Status Bar
- Areas
- Regions
- Tabs & Panels

Window System Introduction

After starting Blender and closing the [Splash Screen](), the Blender window should look similar to the image below.


File
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Help
Layout
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Sculpting
UV Editing
Texture Paint
Shading
Animation
Rendering
Scene
ViewLayer
Object Mode
View
Select
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Object
Global
Options
User Perspective
(1) Collection | Cube
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Collection
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Cube
Light
Cube
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Z 0 m
Rotation X 0°
Y 0°
Z 0°
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Y 1.000
Z 1.000
Delta Transform
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Collections
Playback
Keying
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Marker
1
Start 1
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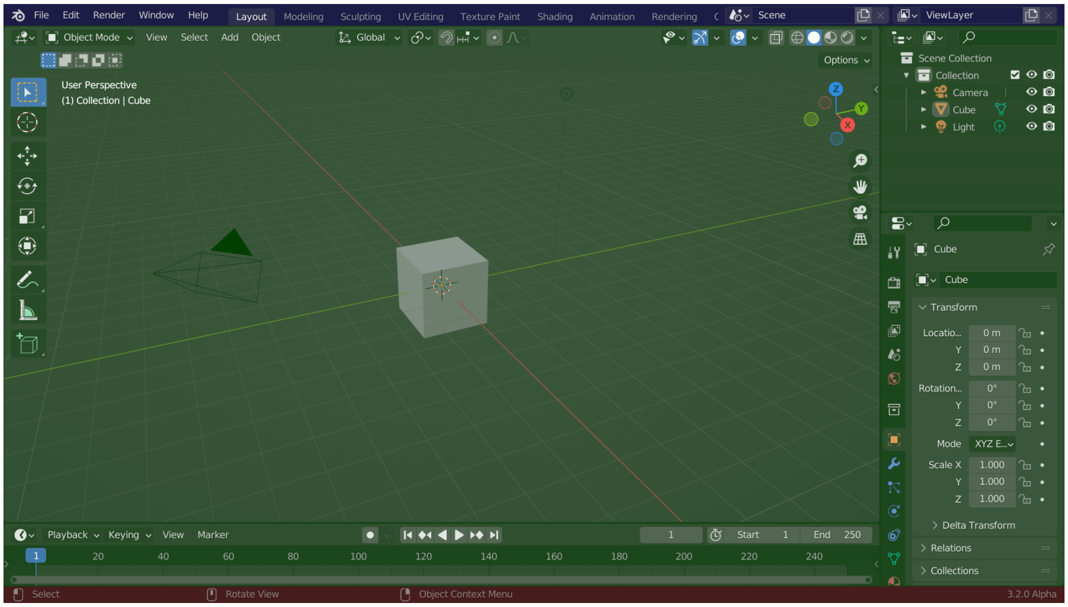
Select
Rotate View
Object Context Menu
3.2.0 Alpha

The default startup Blender window.

Blender's interface is separated into three main parts:

- The [Topbar]() at the very top, consists of the main menu, which is used for saving, importing and exporting files, configuring settings, and rendering among other functions.
- [Areas]() in the middle, which is the main workspace
- The [Status Bar]() at the bottom, which displays shortcut suggestions and relevant statistics.


File
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Object Mode
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180
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Select
Rotate View
Object Context Menu
3.2.0 Alpha

Blender's default Screen Layout. Topbar (blue), Areas (green) and Status Bar (red).

Customization

Keyboard shortcuts

Blender makes heavy use of keyboard shortcuts to speed up work. These can be customized in the Keymap Editor.

Theme colors

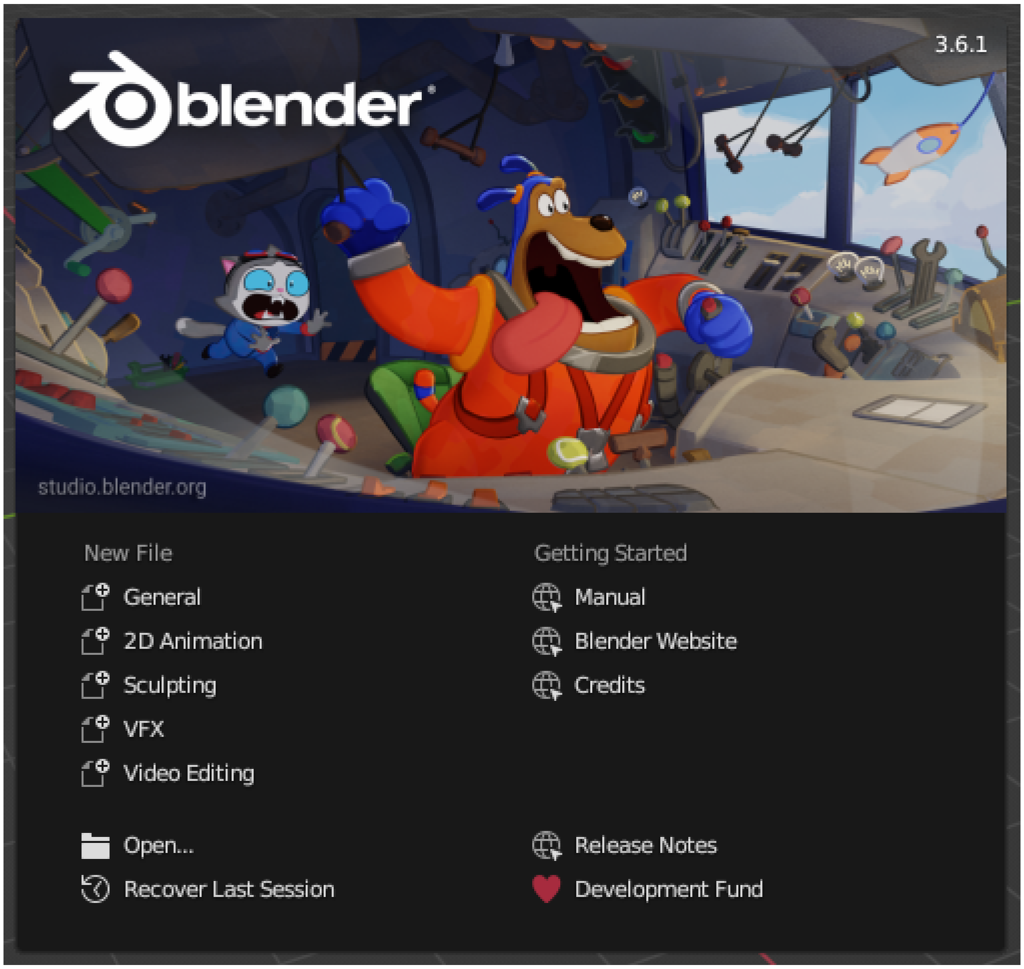
Blender allows for most of its interface colors to be changed to suit the needs of the user. If you find that the colors you see on screen do not match those in the Manual, it could be that your default theme has been altered. Creating a new theme or selecting/altering a preexisting one can be done by opening the Preferences and clicking on the *Themes* tab.

Accessibility

Blender has several options for visibility customization, including resolution scale, and the ability to load custom fonts. These settings can be configured in the Interface Preferences.

Splash Screen

When starting Blender, the splash screen appears in the center of the window. It contains options to create new projects or open recent ones. A more detailed description can be found below.


3.6.1
blender
studio.blender.org
New File
General
2D Animation
Sculpting
VFX
Video Editing
Open...
Recover Last Session
Getting Started
Manual
Blender Website
Credits
Release Notes
Development Fund

Blender Splash Screen.

To close the splash screen and start a new project, click anywhere outside the splash screen (but inside the Blender window) or press `Esc`. The splash screen will disappear revealing the default screen. To reopen the splash screen, click on the Blender icon in the Topbar and select *Splash Screen*.

Note

When starting Blender for the first time or updating to a new version, the “interactive region” contains a Quick Set Up Process.

Splash Image

The upper part of the splash screen contains the splash image with the Blender version in the top right.

Interactive Region

The interactive region is the bottom half of the splash screen.

New File
: Start a new project based on a template.

Recent Files
: Your most recently opened blend-files. This gives quick and easy access to your recent projects.

Open
: Allows opening an existing blend-file.

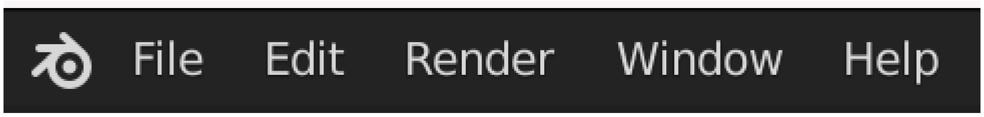
Recover Last Session
: Blender will try to recover the last session based on temporary files. See Recovering Data.

Donate
: Open Blender’s Development Fund website.

What’s New
: Open the latest release notes.

Topbar

Menus



Blender Menu

Splash Screen
Open the Splash Screen.

About Blender
Opens a menu displaying the following information about Blender:

- **Version**: The Blender version.
- **Date**: Date when Blender was compiled.
- **Hash**: The Git Hash of the build. This can be useful to give to support personnel when diagnosing a problem.
- **Branch**: Optional branch name.
- **Windowing Environment**: On Linux, this will show either Wayland or X11 depending on the windowing environment that Blender is running on.
- **Donate**: Open Blender's Development Fund website.
- **What's New**: Open the latest release notes.
- **Credits**: Open the credits webpage.
- **License**: Open the license webpage.
- **Blender Store**: Open the Blender Store website.
- **Blender Website**: Open main Blender website.

Install Application Template
Install a new application template.

File Menu

The options to manage files are:

New `Ctrl-N`

Clears the current scene and loads the selected application template.

Open `Ctrl-O`

Open a blend-file.

Open Recent `Shift-Ctrl-O`

Displays a list of the most recently opened blend-files. Hovering over items will show a preview, and information about the blend-file. Select any of the file names in the list to open that blend-file.

Clear Recent Files List

Removes items from the recent files list.

Revert

Reopens the current file to its last saved version.

Recover

Recover Last Session

This will load a blend-file that Blender automatically saves just before exiting. So this option enables you to recover your last work session, e.g. if you closed Blender by accident.

Recover Auto Save

This will open an automatically saved file to recover it.

Save `Ctrl-S`

Save the current blend-file.

Save As… `Shift-Ctrl-S`

Opens the File Browser to specify file name and location of save.

Save Copy…

Saves a copy of the current file.

Save Incremental `Ctrl-Alt-S`

Save the current Blender file with a numerically incremented name that does not overwrite any existing files.

Link…

Links data from an external blend-file (library) to the current one. The editing of that data is only possible in the external library. *Link* and *Append* are used to load in only selected parts from another file. See Linked Libraries.

Append…

Appends data from an external blend-file to the current one. The new data is copied from the external file, and completely unlinked from it.

Data Previews

Tools for managing data-block previews.

Import

Blender can use information stored in a variety of other format files which are created by other graphics programs. See Import/Export.

Export

Normally you save your work in a blend-file, but you can export some or all of your work to a format that can be processed by other graphics programs. See Import/Export.

Export All Collections

Invokes all configured exporters for all collection.

External Data

External data, like texture images and other resources, can be stored inside the blend-file (packed) or as separate files (unpacked). Blender keeps track of all unpacked resources via a relative or absolute path. See pack or unpack external data.

Automatically Pack Resources

Pack all currently used external files into the blend-file and automatically pack any files that are added later. Unchecking this option will only stop the automatic packing for new files; it won't unpack existing ones.

Pack Resources

Pack all used external files into the blend-file. After running this operator and saving the blend-file, the external files will no longer be used – any changes in them will no longer be reflected in the blend-file, and you are free to move or delete them.

Unpack Resources

Export previously packed files back to external ones. You can choose whether to reuse existing external files or overwrite them.

Pack Linked Libraries

Pack data-blocks that are linked from an external blend-file into the current one.

Unpack Linked Libraries

Export previously packed data-blocks back to external blend-files. Existing blend-files are overwritten.

Make Paths Relative

Make all paths to external files relative to the current blend-file.

Make Paths Absolute

Make all paths to external files absolute (= full path from the system's root).

Report Missing Files

This option is useful to check if there are links to unpacked files that no longer exist. After selecting this option, a warning message will appear in the Info editor's header. If no warning is shown, there are no missing external files.

Find Missing Files

In case you have broken links in a blend-file, this can help you to fix the problem. A File Browser will show up. Select the desired directory (or a file within that directory), and a search will be performed in it, recursively in all contained directories. Every missing file found in the search will be recovered. Those recoveries will be done as absolute paths, so if you want to have relative paths you will need to select *Make Paths Relative*.

Note

Recovered files might need to be reloaded. You can do that one by one, or you can save the blend-file and reload it again, so that all external files are reloaded at once.

Clean Up

Purge Unused Data

Opens a dialog to remove unused data-blocks from both the current blend-file or any Linked Data (cannot be undone). See the Outliner for more information.

Manage Unused Data

Opens a pop-up window of the Outliner in Unused Data mode which lists data-blocks and other data that are unused and/or will be lost when the file is reloaded. It includes data-blocks which have only a fake user. You can add/remove the Fake User by clicking on cross/tick icon on the right side of the Outliner.

Defaults

This menu manages the startup file which is used to store the default scene, workspace, and interface displayed when creating a new file.

Initially this contains the startup scene included with Blender. This can be replaced by your own customized setup.

Save Startup File

Saves the current blend-file as the startup file.

Load Factory Settings

Restores the default startup file and preferences.

When an Application Templates is in use the following operators are shown:

Load Factory Blender Settings

Loads the default settings to the original Blender settings without the changes made from the current application template.

Load Factory (Application Template Name) Settings

Loads the default settings to the original application template.

See also

Managing Preferences.

Quit `Ctrl-Q`

Closes Blender. The current scene is saved to a file called "quit.blend" in Blender's temporary directory (which can be found on the "File Paths" tab of the Preferences).

Edit Menu

Undo, Redo, Undo History

See Undo & Redo.

Adjust Last Operation, Repeat Last, Repeat History

See Undo & Redo.

Menu Search

Find a menu based on its name.

Operator Search

Execute an operator based on its name (Developer Extras only).

Rename Active Item

Rename the active object or node; see Rename tool for more information.

Batch Rename

Renames multiple data types at once; see Batch Rename tool for more information.

Lock Object Modes

Prevents selecting objects that are in a different mode than the current one.

> **Note**
>
> This option can prevent accidental mode changes, such as when you're trying to select a bone in Pose Mode to animate it, but instead click a piece of background scenery (which would normally select that piece and switch to Object Mode).
>
> You may want to disable *Lock Object Modes* for example when weighting rigged objects or sculpting/painting where you intentionally want to switch between objects in different modes.

Preferences `Ctrl-Comma`

Open the Preferences window.

Render Menu

Render Image `F12`

Render the active scene at the current frame.

Render Animation `Ctrl-F12`

Render the animation of the active scene.

> **See also**
>
> - Rendering Animations for details.

Render Audio
: Mix the scene's audio to a sound file.

See also

- Rendering audio for details.

View Render `F11`
: Show the Render window. (Press again to switch back to the main Blender window.)

View Animation `Ctrl-F11`
: Playback rendered animation in a separate player.

See also

- Animation player for details.
- Preferences for selecting a different animation player than the default one.

Lock Interface
: Lock interface during rendering in favor of giving more memory to the renderer.

Window Menu

New Window
: Create a new window by copying the current window.

New Main Window
: Create a new window with its own workspace and scene selection.

Toggle Window Fullscreen
: Toggle the current window fullscreen.

Next Workspace
: Switch to the next workspace.

Previous Workspace

Switch to the previous workspace.

Show Status Bar

Choose whether the Status Bar at the bottom of the window should be displayed.

Save Screenshot

Capture a picture of the current Blender window. A File Browser will open to choose where the screenshot is saved.

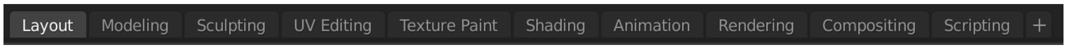
Save Screenshot (Editor)

Capture a picture of the selected Editor. Select the Editor by clicking `LMB` within its area after running the operator. A File Browser will open to choose where the screenshot is saved.

Help Menu

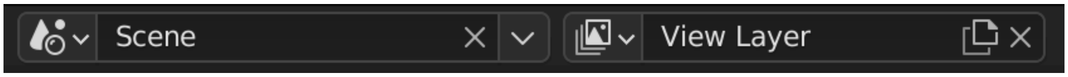
See Help Menu.

Workspaces


Layout
Modeling
Sculpting
UV Editing
Texture Paint
Shading
Animation
Rendering
Compositing
Scripting
+

This set of tabs is used to switch between Workspaces, which are essentially predefined window layouts.

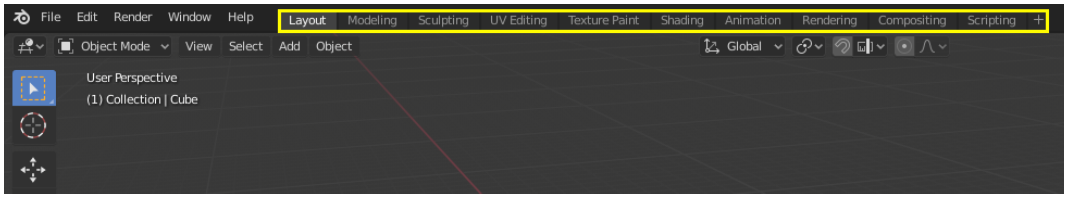
Scenes & Layers


Scene
View Layer

These data-block menus are used to select the current Scene and View Layer.

Workspaces

Workspaces are essentially predefined window layouts. Each Workspace consists of a set of Areas containing Editors, and is geared towards a specific task such as modeling, animating, or scripting. You'll typically switch between multiple Workspaces while working on a project.


File
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Sculpting
UV Editing
Texture Paint
Shading
Animation
Rendering
Compositing
Scripting
+
Object Mode
View
Select
Add
Object
Global
User Perspective
(1) Collection | Cube

Workspaces are located at the Topbar.

Controls

Tabs
: Click on the tabs to switch between the workspaces. You can also use the keyboard shortcuts `Ctrl-PageUp` and `Ctrl-PageDown`. Double-click a tab to rename the workspace.

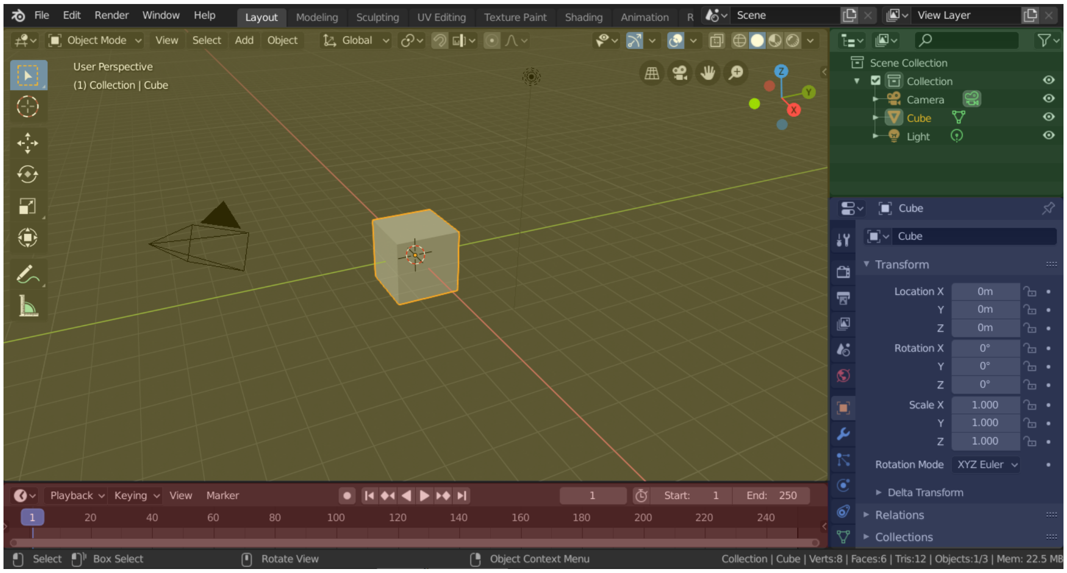
Add +
: Click on the *Add* button to add a new workspace.

Context menu `RMB`
: The context menu contains options to duplicate, delete and reorder workspaces.

Default Workspaces

Blender's default startup shows the "Layout" workspace in the main area. This workspace is a general workspace to preview your scene and contains the following Editors:

- 3D Viewport on top left.
- Outliner on top right.
- Properties on bottom right.
- Timeline on bottom left.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(1) Collection | Cube
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Transform
Delta Transform
Relations
Collections
Playback
Keying
View
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Select
Box Select
Rotate View
Object Context Menu

Location X 0m
Y 0m
Z 0m
Rotation X 0°
Y 0°
Z 0°
Scale X 1.000
Y 1.000
Z 1.000
Rotation Mode XYZ Euler

1 Start: 1 End: 250

Collection | Cube | Verts:8 | Faces:6 | Tris:12 | Objects:1/3 | Mem: 22.5 MB

Blender's 'Layout' Workspace with four editors.

3D Viewport (yellow), Outliner (green), Properties (blue) and Timeline (red).

Blender also has several other workspaces added by default:

Modeling::	For modification of geometry by modeling tools.
Sculpting::	For modification of meshes by sculpting tools.
UV Editing::	For mapping of image texture coordinates to 3D surfaces.
Texture Paint::	For coloring image textures in the 3D Viewport.
Shading::	For specifying material properties for rendering.
Animation::	For making properties of objects dependent on time.
Rendering::	For viewing and analyzing rendering results.
Compositing::	For combining and post-processing of images and rendering information.
Geometry Nodes::	For procedural modeling using Geometry Nodes.
Scripting::	

	For interacting with Blender's Python API and writing scripts.

Additional Workspaces

Blender has a couple additional Workspaces to choose from when adding a new Workspace:

2D Animation

2D Animation::	General workspace to work with Grease Pencil.
2D Full Canvas::	Similar to "2D Animation" but contains a larger canvas.

VFX

Masking::	For creating 2D masks for compositing or video editing.
Motion Tracking::	For calculating camera motion and stabilizing video footage.

Video Editing

Video Editing::	For sequencing together media into one video.

Save and Override

The workspaces are saved in the blend-file. When you open a file, enabling Load UI in the File Browser indicates that Blender should use the file's screen layout rather than the current one.

A custom set of workspaces can be saved as a part of the Defaults.

Workspace Settings

Reference

Editor:: Properties
Panel:: *Tool tab ‣ Workspace*

Pin Scene

When enabled, the current workspace will remember the currently selected scene. Then, whenever you activate the workspace, it'll automatically switch back to that scene.

Mode

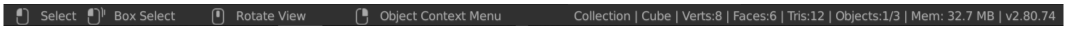
Switch to this Mode when activating the workspace.

Filter Add-ons

Determines which add-ons are enabled in the active workspace. When unchecked, the global add-ons will be used. When checked, you can enable individual add-ons in the list below.

Status Bar

The Status Bar is located at the bottom of the Blender window and displays contextual information such as keyboard shortcuts, messages, and statistical information. The Status Bar can be hidden by disabling *Show Status Bar* in Window menu or by dragging from the top edge down.


Select
Box Select
Rotate View
Object Context Menu

Collection | Cube | Verts:8 | Faces:6 | Tris:12 | Objects:1/3 | Mem: 32.7 MB | v2.80.74

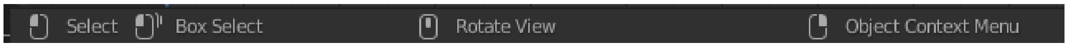
Status Bar.

Keymap Information

The left side of the Status Bar displays mouse button shortcuts and the keymap of the active tool. In editors with a Toolbar, tapping `Alt` (or `Option` on macOS) shows the hotkeys to change to a desired tool.

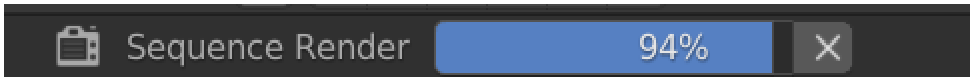
Tip

This functionality can be disabled with the *Alt Click Tool Prompt* preference in the Keymap Preferences).


Select
Box Select
Rotate View
Object Context Menu

Status Messages

The middle of the Status Bar displays information about in-progress operations.


Sequence Render
94%

Running Task

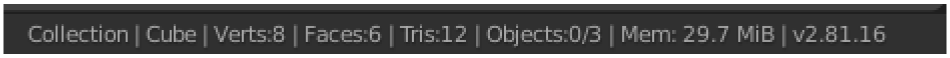
Shows the progress of the currently running task (such as rendering or baking). Hovering the mouse pointer over the progress bar will display a time estimate. The task can be aborted by clicking the cancel button ().

Report Message

Informational messages or warnings, such as after saving a file. They disappear after a short time. Click them to show the full message in the Info Editor.

Resource Information

The right side of the Status Bar displays information about the Blender instance. Which information is shown can be chosen by `RMB` on the Status Bar or in the Preferences.



Collection | Cube | Verts:8 | Faces:6 | Tris:12 | Objects:0/3 | Mem: 29.7 MiB | v2.81.16

Scene Statistics

Shows information about the data in the active scene.

- **Collection**: The name of the active Collection.
- **Active Object**: The name of the active selected object.
- **Geometry**: Information about the current scene depending on the mode and object type. This can be the number of vertices, faces, triangles, or bones.
- **Objects**: The number of selected objects and the total count of objects.

Scene Duration

Shows the total amount of time of the playback along with the current frame number and total frame count. The format of the duration text is determined by the Timecode Style.

System Memory

Shows an estimate of Blender’s RAM consumption. On a single-instance single-machine scenario, this estimate provides a measurement against the hardware limit of the machine.

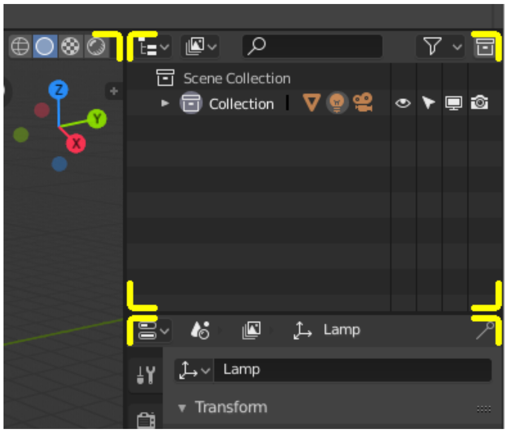
Extensions Updates
Shows the number of extensions with available updates.

Blender Version
Shows the version number of Blender that is currently running.

Areas

The Blender window is divided into a number of rectangles called Areas. Areas reserve screen space for Editors, such as the 3D Viewport or the Outliner. Each editor offers a specific piece of functionality.

Areas are grouped into Workspaces, which are geared towards particular tasks (modeling, animating and so on).



Area boundaries are indicated by rounded corners (yellow highlights).

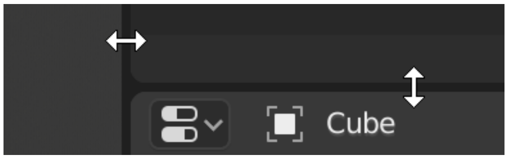
Note

While some keyboard shortcuts in Blender are global (such as `Ctrl-S` for saving), many depend on which editor the mouse cursor is hovering over.

As an example, say you just selected two objects in the Outliner and want to join them. If you pressed the shortcut for this (`Ctrl-J`) while the cursor is still in the Outliner, nothing would happen as the shortcut isn't valid there; you first need to move your cursor to the 3D Viewport.

Resizing

You can resize areas by dragging their borders with `LMB`. Move your mouse cursor over the border between two areas, so that the cursor changes to a double-headed arrow, and then click and drag.



Tip

Hold `Ctrl` to snap the size of areas to convenient sizes.

Docking

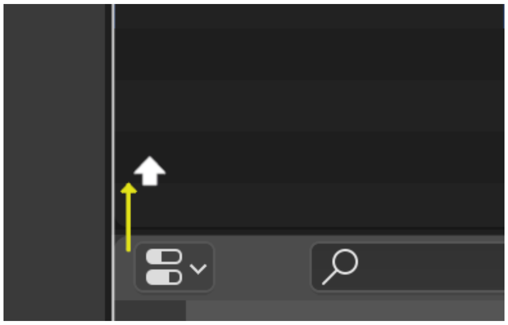
Docking describes several ways an area a user can interactively manipulate the size and location of areas along with splitting an area into new areas.

To start the interactive process, placing the mouse cursor in an area corner will change the cursor to a cross (+). Once the cursor is a cross, press and hold `LMB` to preform any of the following actions:

If you press `Esc` or `RMB` before releasing the mouse, the operation will be canceled.

Joining

Dragging from an area corner into the space of a second area will *join* two areas. The areas that will be joined will be displayed brighter.



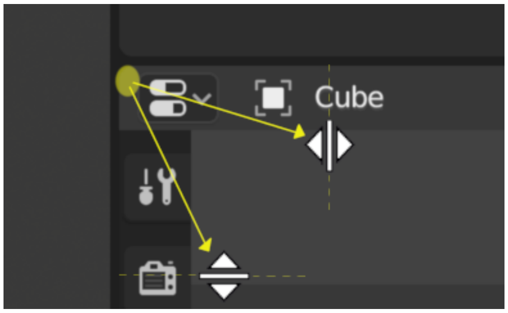
Properties is being joined to the Outliner.

Splitting

Splitting an area will create a new area. Dragging from an area corner left/right will split the area vertically, to split the area horizontally drag up/down.

You can split and join areas at once by dragging a split operation into a separate area.

Dragging an area into the middle of an second area will replace the second area with the first area.



Area Options

`RMB` on the border opens the *Area Options*.

Vertical/Horizontal Split
: Shows an indicator line that lets you select the area and position where to split. `Tab` switches between vertical/horizontal.

Join Up/Down/Left/Right
: Shows the join direction overlay.

Swap Areas
: Swaps this area with the adjacent one.

Swapping Contents

You can swap the contents of two areas by pressing `Ctrl-LMB` on one of the corners of the initial area, dragging towards the target area, and releasing the mouse there. The two areas do not need to be side-by-side, though they must be inside the same window.

Duplicate Area into new Window

Reference	
Menu::	*View* ‣ *Area* ‣ *Duplicate Area into new Window*

A new floating window containing an area can be created from *View ‣ Area ‣ Duplicate Area into new Window*. (Not available in some editors.)

The new window is a fully functional window, which is part of the same instance of Blender. This can be useful, e.g. if you have multiple monitors.

You can also create a new window from an existing area by pressing `Shift-LMB` on an area corner, then dragging outward slightly.

Toggle Maximize Area

Reference

Menu::	*View ‣ Area ‣ Toggle Maximize Area*
Shortcut::	`Ctrl-Spacebar`

Expands the Area so it fills the whole window (while keeping the Topbar and Status Bar visible). To return to normal size, use the keyboard shortcut again or click the *Back to Previous* button in the Topbar.

Toggle Fullscreen Area

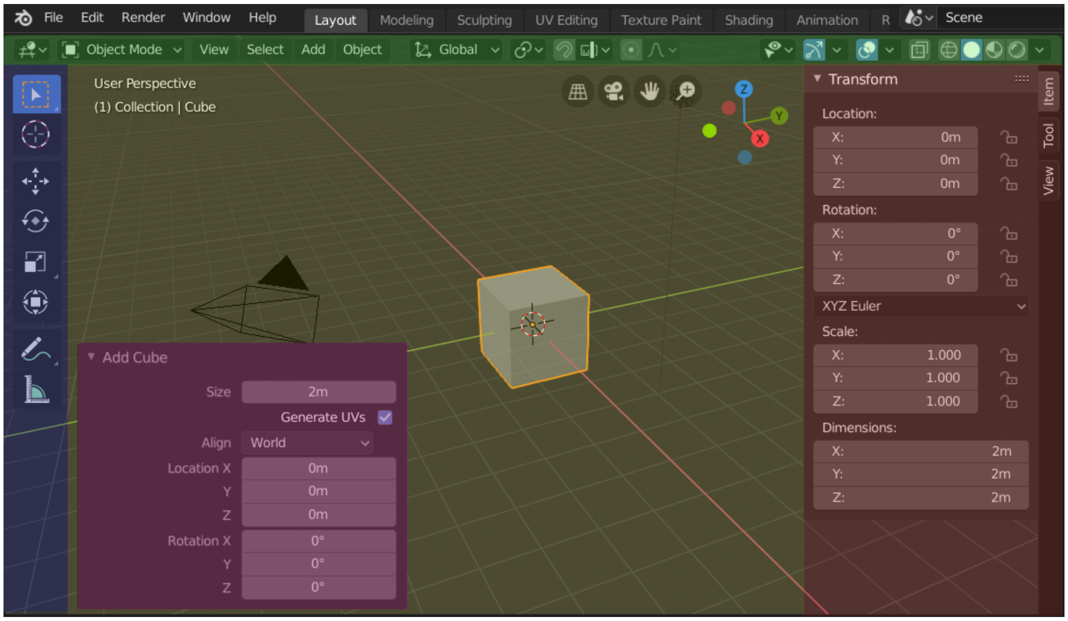
Reference

Menu::	*View ‣ Area ‣ Toggle Fullscreen Area*
Shortcut::	`Ctrl-Alt-Spacebar`

Expands the Area so it fills the whole window, hiding the Topbar, Status Bar, and even the secondary regions (toolbars etc.) of the Area's own editor. To return to normal size, use the keyboard shortcut again or click the icon in the Area's top right corner (only becomes visible when hovering).

Regions

Every Editor in Blender is divided into Regions. Regions can have smaller structuring elements like tabs and panels with buttons, controls and widgets placed within them.


File
Edit
Render
Window
Help
Layout
Modeling
Sculpting
UV Editing
Texture Paint
Shading
Animation
R
Scene
Object Mode
View
Select
Add
Object
Global
User Perspective
(1) Collection | Cube
Item
Tool
View

Add Cube
Size 2m
Generate UVs ☑
Align World
Location X 0m
Y 0m
Z 0m
Rotation X 0°
Y 0°
Z 0°

Transform
Location:
X: 0m
Y: 0m
Z: 0m
Rotation:
X: 0°
Y: 0°
Z: 0°
XYZ Euler
Scale:
X: 1.000
Y: 1.000
Z: 1.000
Dimensions:
X: 2m
Y: 2m
Z: 2m

The regions of the 3D Viewport showing the Sidebar and the Adjust Last Operation panel after adding a Cube.

Header (green), Main region (yellow), Toolbar (blue), Sidebar (red) and Adjust Last Operation panel (pink).

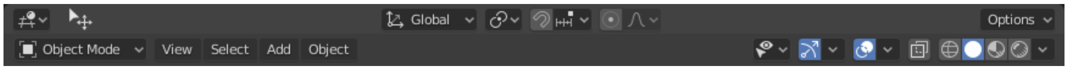
Main Region

At least one region is always visible. It is called the Main region and is the most prominent part of the editor.

Each editor has a specific purpose, so the main region and the availability of additional regions are different between editors. See specific documentation about each editor in the Editors chapter.

Header

A header is a small horizontal strip, which sits either at the top or bottom of an area. All editors have a header acting as a container for menus and commonly used tools. Menus and buttons will change with the editor type and the selected object and mode.



The Header of the 3D Viewport.

Context Menu

`RMB` on a header reveals a context menu with a couple options:

Show Header
Toggles the visibility of the header. If a header is hidden, it can be made visible again by clicking or dragging the small arrow that appears at the top/bottom right of the editor.

Show Tool Settings
Toggles the visibility of the Tool Settings.

Show Menus
Toggles whether the Menus are collapsed or not.

Flip to Bottom/Top
Toggles whether the header or Tool Settings appear on the top or bottom of the editor.

Vertical/Horizontal Split
Shows an indicator line that lets you select the area and position where to split. `Tab` switches between vertical/horizontal.

Maximize/Full Screen Area
See Toggle Maximize Area.

Duplicate Area into New Window
  See Duplicate Area into new Window.

Close Area
  Closes the area and replaces it with the expansion of a neighboring area.

Toolbar

The Toolbar (on the left side of the editor area) contains a set of interactive tools. `T` toggles the visibility of the Toolbar.

Tool Settings

A horizontal strip at the top or bottom of the editor (similar to the header) containing settings for the currently selected tool. Just like the header, it can be hidden and moved through its context menu.

Adjust Last Operation

Adjust Last Operation is a region that allows tweaking an operator after running it. For example, if you just added a cube, you can use this region to tweak its size.

Sidebar

The *Sidebar* (on the right side of the editor area) contains Panels with settings of objects within the editor and the editor itself. `N` toggles the visibility of the Sidebar.

Footer

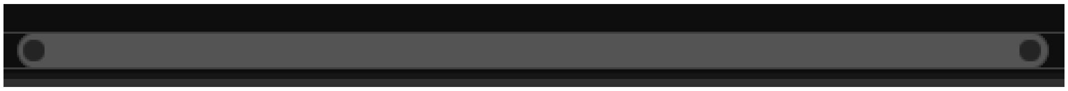
Some editors show a bar (on top/bottom of the editor area) that displays information about for example the active tool or operator.

Arranging

Scrolling

A region can be scrolled vertically and/or horizontally by dragging it with the `MMB`. If the region has no zoom level, it can also be scrolled by using the `Wheel` while the mouse hovers over it.

Some regions, in particular animation timelines, have scrollbars with added control points to adjust the vertical or horizontal range of the region. These special scrollbars will have added widgets at the ends, as shown in the following image:



Scrollbars with zoom widgets.

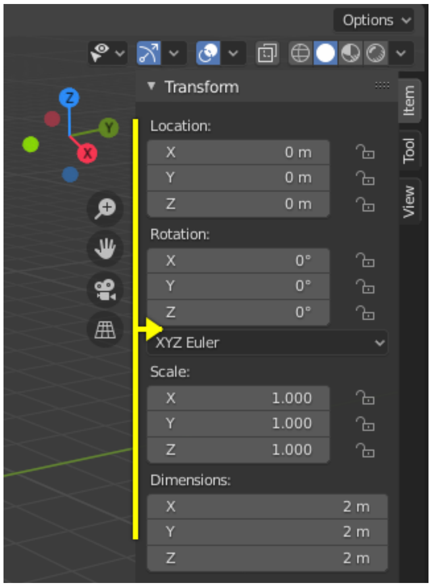
This can be used to stretch or compress the range to show more or less detail within the available screen space. Simply drag one of the dots to either increase or decrease the displayed range. You can also quickly adjust both the horizontal and vertical range by dragging in the editor with `Ctrl-MMB`.

Changing the Size and Hiding

Resizing regions works by dragging their border, the same way as Areas.

To hide a region, resize it down to nothing. A hidden region leaves a little arrow sign. `LMB` on this icon to make the region reappear.

Hiding and showing the Sidebar.


Options
Item
Tool
View

Transform

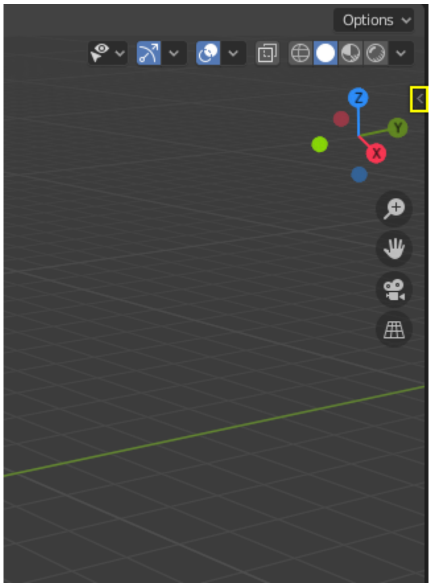
Location:
X 0 m
Y 0 m
Z 0 m

Rotation:
X 0°
Y 0°
Z 0°

XYZ Euler

Scale:
X 1.000
Y 1.000
Z 1.000

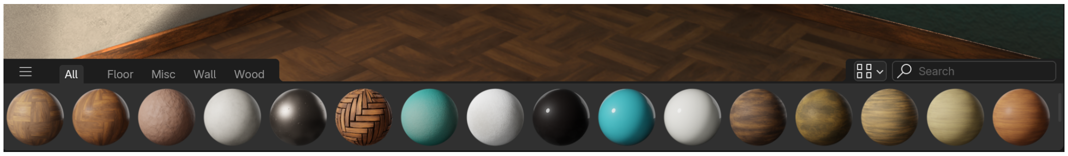
Dimensions:
X 2 m
Y 2 m
Z 2 m



Scaling

The scale of certain regions (such as the Toolbar) can be changed by dragging inside them with `Ctrl-MMB`, or using `NumpadPlus` and `NumpadMinus` while hovering the mouse cursor over them. Press `Home` to reset the scale to the default.

Asset Shelf

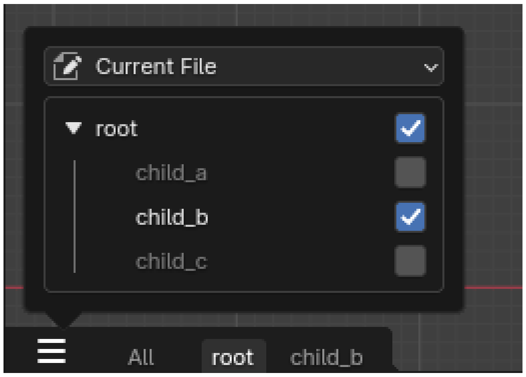

All
Floor
Misc
Wall
Wood
Search

The Asset Shelf of the 3D View, showing material assets.

Search

To search for assets, hover your mouse over the Asset Shelf, then press Ctrl-F and type a search query. This will filter the poses to match what you typed.

Tabs


Current File

root ☑

child_a ☐

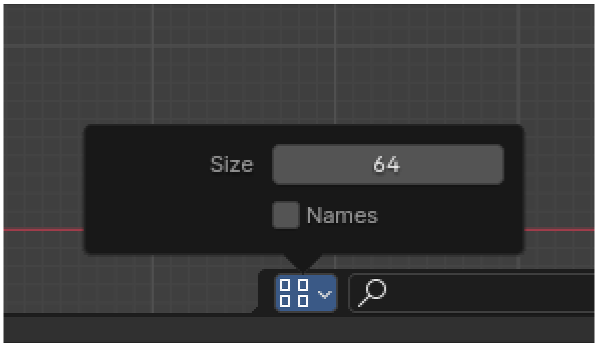
child_b ☑

child_c ☐

The usage of catalogs as tabs.

Catalogs can be shown as individual tabs. Each tab will only show its content, and the content of its children. That makes it easy to filter down to a certain set of assets.

Display Options


Size 64

☐ Names

Display options available for the asset shelf.

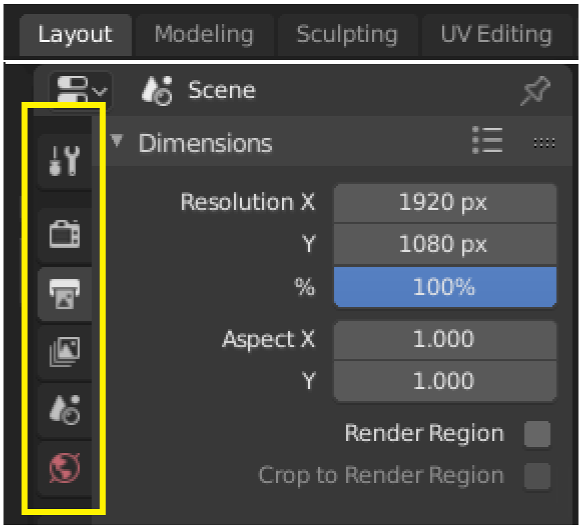
It is possible to change the size of items on the shelf by using the size property.

By toggling on the “Names” checkbox, the asset names will be shown in the shelf. Alternatively it is also possible to hover over an item to show its name.

Tabs & Panels

Tabs

Tabs are used to control overlapping sections in the user interface. The content of only one Tab is visible at a time. Tabs are listed in a *Tab header*, which can be horizontal or vertical.



Resolution X 1920 px
Y 1080 px
% 100%
Aspect X 1.000
Y 1.000
Render Region ☐
Crop to Render Region ☐

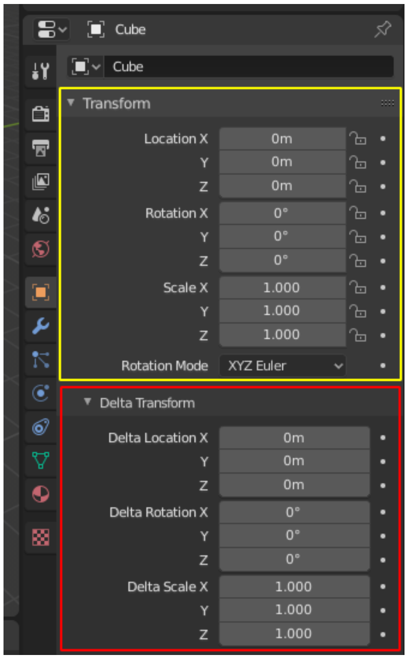
Top: Horizontal Tab header in the Topbar. Bottom: Vertical Tab header shows tab icons in the Properties.

Switching/Cycling

Vertical tabs can be switched with `Ctrl-Wheel` from anywhere in the tab. You can also cycle through tabs with `Ctrl-Tab` and `Shift-Ctrl-Tab`, or press down `LMB` and move the mouse over the tab header icons. (This does not apply to Workspace tabs; see Workspace controls.)

Panels

The smallest organizational unit in the user interface is a panel. The panel header shows the title of the panel. It is always visible. Some panels also include subpanels.



Location X 0m
Y 0m
Z 0m
Rotation X 0°
Y 0°
Z 0°
Scale X 1.000
Y 1.000
Z 1.000
Rotation Mode XYZ Euler

Delta Location X 0m
Y 0m
Z 0m
Delta Rotation X 0°
Y 0°
Z 0°
Delta Scale X 1.000
Y 1.000
Z 1.000

Panels in Properties.

A panel is highlighted in yellow and a subpanel in red.

Collapsing and Expanding

A panel can either be expanded to show its contents, or collapsed to hide its contents. An expanded panel is indicated by a down-arrow (▼) in the panel header, while a collapsed panel is shown with a right-arrow (►).

- Clicking `LMB` on the panel header expands or collapses it.
- Pressing `A` expands/collapses the panel under the mouse pointer.
- Clicking `Ctrl-LMB` on the header of a collapsed panel will expand it and collapse all others.
- Clicking `Ctrl-LMB` on the header of an expanded panel will expand/collapse all its subpanels.
- Dragging with `LMB` over the headers will expand or collapse many at once.

Position

You can change the position of a panel within its region by clicking and dragging the grip widget (::::) on the right side of its header.

Pinning

Sometimes it is desirable to view panels from different tabs at the same time. Like, for instance, having access to a camera’s properties, while other objects are selected. This has been solved by making panels pinnable.

A pinned panel remains visible regardless of which tab has been selected. You can pin a panel by clicking on the pin icon in its header. Panels that do not have a pin icon can be pinned by `RMB` on the panel header and selecting *Pin*, or by pressing `Shift-LMB`.

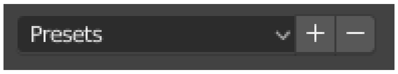
Note

Pinning is not available for all panels. For example, it’s available in the Sidebar but not in the Properties editor.

Presets

Selector

A list of available presets. A selection will override the included properties.



Example Presets menu.

Add +

New presets can be added based on the currently applied set of properties, which will be saved for later reuse. A pop-up opens where you can set a name, after which you can select it from the list and in some cases additional settings.

Remove –

Deletes the selected preset.

Keymap

- Common Shortcuts
- Default Keymap
- Industry Compatible Keymap

Common Shortcuts

Conventions Used in This Manual

Keyboards

Hotkey letters are shown in this manual like they appear on a keyboard; for example:

`G`
: refers to the lowercase `g`.

`Shift`, `Ctrl`, `Alt`
: are specified as modifier keys.

`Ctrl-W`, `Shift-Alt-A`, …
: indicates that these keys should be pressed simultaneously.

`Numpad0` to `Numpad9`, `NumpadPlus`
: refer to the keys on the separate numeric keypad.

Other keys are referred to by their names, such as `Esc`, `Tab`, `F1` to `F12`. Of special note are the arrow keys, `Left`, `Right` and so on.

Mouse

This manual refers to mouse buttons as:

`LMB`
: Left Mouse Button

`RMB`
: Right Mouse Button

`MMB`

Middle Mouse Button

`Wheel`, `WheelUp` & `WheelDown`
Scrolling the wheel.

Note

Blender has two main selection modes: left-click select and right-click select. See the Select with Mouse Button preference.

While left-click select is the default as it's the most common in other applications, right-click select does have its advantages. See: Learn the benefits of right-click select.

Hovering

While hovering (when the cursor is held over a button).

Properties

- `Ctrl-C` – Copy the (single) value of the button.
- `Ctrl-V` – Paste the (single) value of the button.
- `Ctrl-Alt-C` – Copy the entire vector or color of the field.
- `Ctrl-Alt-V` – Paste the entire vector or color of the field.
- `RMB` – Open the context menu.
- `Backspace` – Clear the value (sets to zero or clears a text field).
- `Minus` – Negate number values (multiply by -1.0).
- `Ctrl-Wheel` – Change the value incremental steps.

  For pop-up option menus buttons, this cycles the value.

- `Return` – Activates menus or toggles the value.
- `Alt` – Hold while editing values to apply the change to all selected items (objects, bones, sequence-strips).

  This can be used for number fields and toggles.

Animation

- `I` – Insert a keyframe.
- `Alt-I` – Clear the keyframe.
- `Shift-Alt-I` – Clear all keyframes (removing all F-Curves).
- `Ctrl-D` – Assign a driver.
- `Ctrl-Alt-D` – Clear the driver.
- `K` – Add a Keying Set.
- `Alt-K` – Clear the Keying Set.

Python Scripting

- `Ctrl-C` over any Operator Buttons copies their Python command into the clipboard.

  This can be used in the Python Console or in the Text editor when writing scripts.

- `Shift-Ctrl-C` over property buttons copies their data path for this property (also available from the context menu).

  Useful when writing drivers or scripts.

- `Shift-Ctrl-Alt-C` over property buttons copies their *full* data path for the data-block and property.

  Note that in most cases it is best to access values based on the context, instead of by name.

Dragging

- `Ctrl` – While dragging, snap to discrete steps.
- `Shift` – Gives precision control over the value.
- `Shift-Ctrl` – Precise snap will move the object with high precision along with the snapping constraint.

Text Editing

- `Home` – Go to the start of the line.
- `End` – Go to the end of the line.
- `Left`, `Right` – Move the cursor a single character.
- `Ctrl-Left`, `Ctrl-Right` – Move the cursor an entire word.
- `Backspace`, `Delete` – Delete characters.
- `Ctrl-Backspace`, `Ctrl-Delete` – Delete words.
- `Shift` – Select while holding the key and moving the cursor.
- `Ctrl-A` – Select all text.
- `Ctrl-C` – Copy the selected text.
- `Ctrl-X` – Cut the selected text.
- `Ctrl-V` – Paste text at the cursor position.

Confirm & Cancel

- `Esc`, `RMB` – Cancel.
- `Return`, `LMB` – Confirm.

Default Keymap

While this isn't a comprehensive list, this page shows common keys used in Blender's default keymap.

Global Keys

`Ctrl-O`	Open file.
`Ctrl-S`	Save file.
`Ctrl-N`	New file.
`Ctrl-Z`	Undo.
`Shift-Ctrl-Z`	Redo.
`Ctrl-Q`	Quit.
`F1`	Help *(context sensitive)*.
`F2`	Rename active item.
`F3`	Menu Search.

`F4`	File context menu.
`F5` - `F8`	*Reserved for user actions*.
`F9`	Adjust last operation.
`F10`	*Reserved for user actions*.
`F11`	Show render window.
`F12`	Render the current frame.
`Q`	Quick access (favorites).
`Ctrl-Spacebar`	Toggle Maximize Area.
`Ctrl-PageUp` / `Ctrl-PageDown`	Next/previous Workspace.
`Spacebar`	User configurable. **Play::** Toggle animation playback. **Tools::** Tool switching with hotkeys (`Shift-Spacebar` for play). **Search::**

	Search for actions (`Shift-Spacebar` for play).
`Shift-Ctrl-Spacebar`	Playback animation (reverse).

Common Editing Keys

`X`	Deletes the selected item, requires a confirmation dialog.
`Delete`	Deletes the selected item, does not require a confirmation dialog.

Common Editor Keys

These keys are shared across editors such as the 3D Viewport, UV and Graph editor.

`A`	Select all.
`Alt-A`	Select none.
`Ctrl-I`	Invert selection.
`H`	Hide selection.

`Alt-H`	Reveal hidden items.
`T`	Toggle Toolbar.
`N`	Toggle Sidebar.

3D Viewport Keys

`Tab`	Toggle Edit mode.
`Ctrl-Tab`	Toggle Pose mode for armatures, or show a mode switching pie menu for others.
`1` - `3`	In Edit Mode, switch between editing vertices (`1`), edges (`2`), or faces (`3`). Hold `Shift` to toggle one of these without disabling the others. Hold `Ctrl` to alter how the selection is transformed from the old mode to the new. See Mesh Selection Modes for details.
`AccentGrave`	Show 3D Viewport navigation pie menu.
`Ctrl-AccentGrave`	Toggle gizmos.

`Shift-AccentGrave`	Start Walk/Fly Navigation.

Platform Specific Keys

macOS

The `Cmd` key can be used instead of `Ctrl` on macOS for all but a few exceptions which conflict with the operating system.

List of additional macOS specific keys:

`Cmd-Comma`	Preferences.

Keymap Preferences

Select with Mouse Button

Controls which mouse button, either left or right, is used to select items in Blender. If *Left* is selected, the `RMB` will be a context sensitive menu. If *Right* is selected, the `LMB` will place the 3D Cursor.

Spacebar Action

Controls the action of `Spacebar`. These and other shortcuts can be modified in the keymap preferences.

Play::	Starts playing through the Timeline. This option is good for animation or video editing work.
Tools::	Opens the Toolbar underneath the cursor to quickly change the active tool. This option is good if you are doing a lot of modeling or rigging work.
Search::	

	Opens up the Menu Search. This option is good for someone who is new to Blender and is unfamiliar with the menus and shortcuts.

Activate Gizmo Event

The activation event for gizmos that support drag motion. This option is only available when Left click *Select with Mouse Button* is chosen.

Press::	The gizmo's operation gets initiated (and additional options become available in the Status Bar) the moment you press down the mouse button on the gizmo.
Drag::	The operation only gets initiated once you start dragging the gizmo.

Tool Keys

The method of keys to activate tools such as move, rotate, and scale.

Immediate::	Activate actions immediately.
Active Tool::	Activate the tool for editors that support tools.

Alt Click Tool Prompt

Tapping `Alt` shows a prompt in the status bar prompting a second keystroke to activate the tool. Note that this option is not available when using Emulate 3 Button Mouse.

Alt Tool Access

Hold `Alt` to use the Active Tool when the gizmo would normally be required. (For example, with the Move tool selected, you can hold `Alt` and drag the mouse anywhere in the viewport to move the selected object, rather than having to drag its gizmo.) This option is only available when *Select with Mouse Button* is set to Left click and Emulate 3 Button Mouse is disabled.

Select All Toggles

Causes selection shortcut `A` to deselect all when any selection exists.

Region Toggle Pie

`N` opens a pie menu to toggle Regions, rather than toggling a single region.

3D Viewport

Grave Accent / Tilde Action

Navigate::	Navigation pie menu, useful on systems without a numeric keypad.
Gizmos::	Transform gizmos pie menu, useful for quickly switching between transform gizmos. Note that this doesn't apply to tools that force a certain gizmo (Move, Rotate, Scale and Transform); if you have such a tool selected, the gizmo will stay the same no matter what you choose in the pie menu.

Middle Mouse Action

The action when `MMB` dragging in the viewport, this also applies to trackpads.

Orbit::	Rotates the view around a pivot point, `Shift-MMB` is used for panning the view.
Pan::	Shifts the view towards the mouse, `Shift-MMB` is used for orbiting the view.

Alt Middle Mouse Drag Action

Relative::	Set the view axis where each mouse direction maps to an axis relative to the current orientation.
Absolute::	Set the view axis where each mouse direction always maps to the same axis.

Tab for Pie Menu

Causes `Tab` to open a pie menu (swaps `Tab` and `Ctrl-Tab`).

Pie Menu on Drag

This allows keys to have a secondary drag action.

`Tab`

tap::	Toggles Edit Mode.
drag::	Object Mode pie menu.

`Z`

tap::	Toggles wireframe view.
drag::	Display mode pie menu.

`AccentGrave`

tap::	First person Fly/walk Navigation.
drag::	View axis pie menu.

Extra Shading Pie Menu Items

Show additional items in the shading menu (`Z` key).

Transform Navigation with Alt

During transformations, use `Alt` to navigate the 3D Viewport.

When disabled, hotkeys for proportional editing, automatic constraints, and auto IK chain length will require holding `Alt`.

File Browser

Open Folders on Single Click

Navigate into folders by clicking on them once instead of twice.

Industry Compatible Keymap

While this is not a comprehensive list, this page shows common keys used in the industry compatible keymap.

General

1 - 3	Switch Selection mode
4`	Object Mode
5`	Modes Pie Menu
RMB	Context menu
Tab	Menu Search.
Shift–Tab	Quick access (favorites)
Return	Rename
Ctrl–Return	Render
Ctrl–[	Toggle Toolbar

`Ctrl-]`	Toggle Sidebar

Common Editing Keys

`Backspace`	Deletes the selected item, requires a confirmation dialog.
`Delete`	Deletes the selected item, does not require a confirmation dialog.
`Ctrl-D`	Duplicate
`P`	Set Parent
`B`	Proportional Editing / Soft Selection

Viewport

`Alt-LMB`	Orbit View
`Alt-MMB`	Pan View
`Alt-RMB`	Zoom View
`F1` - `F4`	Front/Side/Top/Camera Viewpoints

`F`	Frame Selected
`Shift F`	Center View to Mouse
`A`	Frame All

Selection

`LMB`	Select
`Ctrl-A`	Select All
`Shift-Ctrl-A`	Deselect All
`Ctrl-I`	Select Inverse
`Up`	Select More
`Down`	Select Less
Double `LMB`	Select Loop
Double `Alt-LMB`	Select Ring

`Ctrl L`	Select Linked

Tools

`W`, `E`, `R`	Transform Tools
`Q`	Select Tools
`D`	Annotate
`C`	Cursor Tool

Edit Mode Tools

`Ctrl-E`	Extrude
`Ctrl-B`	Bevel
`I`	Inset
`K`	Knife
`Alt-C`	Loop Cut

Animation

`Spacebar`	Play/Pause
`S`	Set Location + Rotation + Scale keyframe
`Shift-S`	Insert Keyframe menu
`Shift-W`	Set Location Key
`Shift-E`	Set Rotation Key
`Shift-R`	Set Scale Key

Platform Specific Keys

macOS

The `Cmd` key can be used instead of `Ctrl` on macOS for all but a few exceptions which conflict with the operating system.

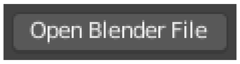
UI Elements

- Buttons
- Input Fields
- Menus
- Eyedropper
- Decorators
- Data-Block Menu
- List View
- Color Picker
- Color Ramp Widget
- Color Palette
- Curve Widget

Buttons

Operator Buttons

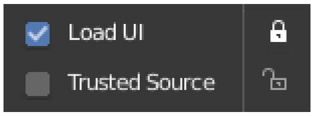
Operator buttons execute an Operator which in summary execute an action when clicked with `LMB`. Operator buttons may be an icon, text, or text with an icon.



Operator button.

Checkboxes & Toggle Buttons

These controls are used to activate or deactivate options. Use `LMB` to change their state. A tick is shown on checkboxes when the option is activated. Active status on toggle buttons is indicated either by color on the icon background, or a change in icon graphics.



☑ Load UI

☐ Trusted Source

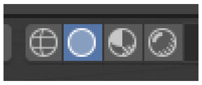
Checkboxes and Toggle buttons.

Dragging

To change many values at once on or off, you can press down `LMB` and drag over multiple buttons. This works for checkboxes, toggles and to select a radio button value.

Radio Buttons

Radio buttons are used to choose one option from a selection of options. The active button is indicated by a colored background.



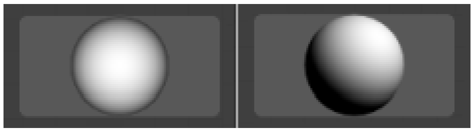
Radio buttons.

Cycling

Use `Ctrl-Wheel` while hovering the mouse over radio buttons to cycle between the options.

Direction Buttons

Clicking with `LMB` in the sphere and dragging the mouse cursor lets the user change the direction by rotating the sphere.



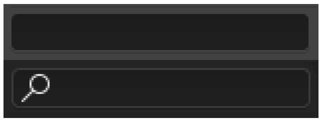
Direction buttons.

Shortcuts

- `LMB` (drag) rotates the direction.
- `Ctrl` (while dragging) snaps to vertical & diagonal directions.

Input Fields

Text & Search Fields

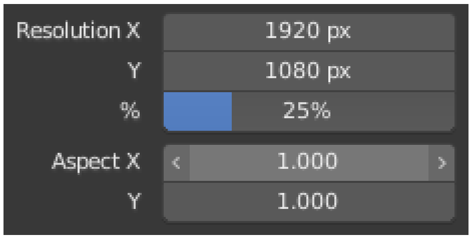


A text and a search field.

Text fields show a rounded rectangular border, and optionally an icon and/or text inside the border. Text fields store text strings, and provide the means to edit text by standard text editing shortcuts.

For text fields with an icon and pop-ups, see Data ID.

Number Fields



Resolution X 1920 px
Y 1080 px
% 25%
Aspect X 1.000
Y 1.000

Number fields.

Number fields store values and units.

The first type of number field shows triangles pointing left (<) and right (>) on the sides of the field when mouse pointer is over the field.

Sliders, a second type of number field, have a colored bar in the background to display values over a range, e.g. percentage values.

The value can be edited in several ways:

Incremental Steps

> To change the value in unit steps, click `LMB` on the small triangles (not available for sliders). You can also use `Ctrl-Wheel` while hovering over the field to edit the value.

Dragging

To change the value with the mouse, hold down `LMB` and drag to left or right.

Hold `Ctrl` to snap to the discrete steps while dragging or `Shift` for precision input.

Keyboard Input

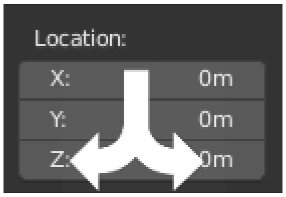
Press `LMB` or `Return` to enter value by typing it with keyboard.

When entering values by keyboard, number fields work like text fields:

- Press `Return` or `LMB` outside the field to apply the change.
- Press `Esc` or `RMB` to cancel.
- Press `Tab` to jump to the next field or `Shift-Tab` to go to the previous field.
- Press `Minus` while hovering over a number field to negate the value.

Multi-Value Editing

You can edit multiple number fields at once by pressing down `LMB` on the first field, and then dragging vertically over the fields you want to edit. Finally you can either drag left or right to adjust value with the mouse, or release the `LMB` and type in a value.



Location:
X: 0m
Y: 0m
Z: 0m

Multi-value editing.

Value Limits

Most numerical values are restricted by “soft limit” and “hard limit” value ranges. Changing values by dragging with the mouse is restricted to the “soft limit” value range. Input via keyboard will allow the use of wider value ranges, but never wider than the “hard limit”.

Expressions

You can enter mathematical expressions into any number field. For example, enter `3*2` or `10/5+4` instead of `6`. Even constants like `pi` (3.142) or functions like `sqrt(2)` (square root of 2) may be used.

See also

These expressions are evaluated by Python; for all available math expressions see: Math module reference.

Expressions as Drivers

You may want your expression to be re-evaluated after it is entered. Blender supports this using Drivers (a feature of the animation system).

Expressions beginning with `#` have a special use. Instead of evaluating the value and discarding the expression, a driver is added to the property with the expression entered.

The expression `#frame` is a quick way to map a value to the current frame, but more complex expressions like `#fmod(frame, 24) / 24` are also supported.

This is simply a convenient shortcut to add drivers which can also be added via the `RMB` menu.

Units

As well as expressions, you can specify numbers and units. If no unit is given, then a default unit is applied. The unit system can be changed in scene settings.

You can use either the unit abbreviation or the full name after the value.

Examples of valid usage of length units include:

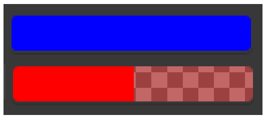
- `1cm`
- `1m 3mm`
- `1m, 3mm`
- `2ft`
- `3ft/0.5km`
- `2.2mm + 5' / 3" - 2yards`

Note

Using Units

- Decimal separator is optional.
- You can mix units, e.g. metric and imperial even though you can only show one at a time.
- Plurals of the names are recognized too, so `meter` and `meters` can both be used.

Color Fields



Color fields. With and without alpha.

The color field stores a color value. Clicking on it with `LMB` opens the [Color Picker].

Color fields with an alpha channel are divided in half: on the left, the color is shown without an alpha channel, and on the right, it's shown with an alpha channel over a checker pattern.

Colors can be copied to other color fields by dragging and dropping.

Hovering over a color property will display a large swatch preview of the color and the color's hexadecimal, RGBA, and HSVA values.

Menus

Blender uses a variety of different menus for accessing options and Operators. Menus can be interacted with in the following ways:

Mouse selection
: `LMB` on the desired item.

Numerical selection
: You can use the number keys or numpad to input an item in the list to select. For example, `Numpad1` will select the first item and so on.

If a menu is too large to fit on the screen, a small scrolling triangle appears on the top or bottom. Scrolling is done by moving the mouse above or below this triangle.

Shortcuts

- Use `Wheel` while hovering with the mouse.
- Arrow keys can be used to navigate.
- Each menu item has an underlined character which can be pressed to activate it.
- Number keys or numpad can also be used to activate menu items. (`1` for the first menu item, `2` for the second etc. For larger menus, `Alt-1` activates the 11th and so on, up to `Alt-0` for the 20th.)
- Press `Return` to activate the selected menu item.
- Press `Esc` to close the menu without activating any menu item. This can also be done by moving the mouse cursor far away from the menu, or by `LMB` clicking anywhere outside of it.

Popup Menus

Popup menus list Operators which can be executed by selecting with `LMB` or using the generated shortcut indicated by the underlined character of the operator name. All menu entries show any relevant shortcut keys, which can be executed without opening the menu.

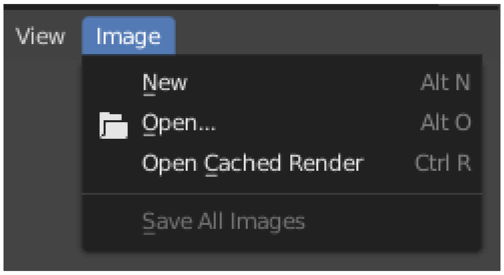

View
Image
New
Alt N
Open...
Alt O
Open Cached Render
Ctrl R
Save All Images

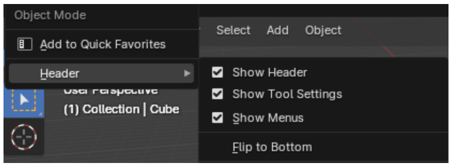
Image menu in the Header of the Image editor.

All popup menus can be searched by pressing `Spacebar` and typing the name of the operator in the menu. If a popup menu has "Search" as one of the items, the menu can be searched without having to press `Spacebar` first.

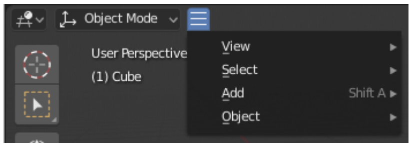
All popup menus of an editor can be searched using the [Menu Search](#) feature.

Collapsing Menus

Sometimes it's helpful to gain some extra horizontal space in the header by collapsing menus. This can be accessed from the header context menu: click `RMB` on the header and uncheck the *Show Menus checkbox*.


Object Mode
Add to Quick Favorites
Header
User Perspective
(1) Collection | Cube
Select
Add
Object
☑ Show Header
☑ Show Tool Settings
☑ Show Menus
Flip to Bottom

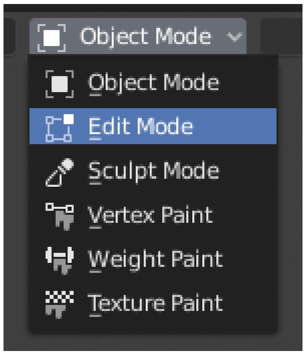
Right-click on any of the header menus.


Object Mode
User Perspective
(1) Cube
View
Select
Add
Shift A
Object

Access the menu from the collapsed icon.

Select Menus

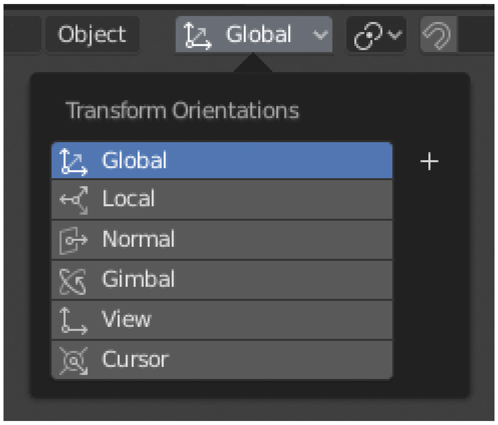
A Select menu (or "selector" for short) lets you choose between a set of options. It appears as an icon and/or text with a down arrow on the right side. To use it, click the button with `LMB` to show the available options, then click the desired option (once selected, it'll appear inside the button). You can also use `Ctrl-Wheel` to cycle through the options without opening the menu.


Object Mode
Object Mode
Edit Mode
Sculpt Mode
Vertex Paint
Weight Paint
Texture Paint

The 3D Viewport Mode Select menu.

Popover Menus

Popover menus are similar to Select Menus, but can show more varied content such as a title, buttons, sliders, etc.


Object
Global
Transform Orientations
Global
+
Local
Normal
Gimbal
View
Cursor

The Transform Orientations popover menu.

Context Menu

Context menus are pop-ups that can be opened with `RMB`. In most editors, it's also possible to use the `Menu` key. The contents of the menu depend on the location of the mouse pointer.

When invoked in an editor, the menu contains a list of operators sensitive to the editor's mode. When invoked over buttons and properties, common options include:

Single
: Apply the change to a single value of a set (e.g. only the X coordinate of an object's Location).

All
: Apply the change to all values in a set (e.g. all coordinates of an object's Location).

Reset to Default Value(s) `Backspace`
: Replaces the current value by the default.

Copy Data Path `Shift-Ctrl-C`
: Copies the Python property data path, relative to the data-block. Useful for Python scripting.

Copy Full Data Path `Shift-Ctrl-Alt-C`
: Copies the full Python property data path including any needed context information.

Copy As New Driver
: Creates a new driver using this property as input, and copies it to the clipboard. Use *Paste Driver* to add the driver to a different property, or *Paste Driver Variables* to extend an existing driver with a new input variable.

Copy To Selected
: Copies the property value to the selected object's corresponding property. A use case is if the Properties context is pinned.

Assign Shortcut
: Lets you define a keyboard or mouse shortcut for an operation. To define the shortcut you must first move the mouse cursor over the button that pops up. When "Press a key" appears you must press and/or click the desired shortcut. Press `Esc` to cancel.

See also

Common Shortcuts.

Change Shortcut

Lets you redefine the shortcut.

Remove Shortcut

Unlinks the existing shortcut.

Open File Location, Open Location Externally

Opens the containing folder using the operating system’s file manager.

Online Manual `F1`

Opens an online page of the Blender Manual in a web browser.

Online Python Reference

Context-sensitive access to the Python API Reference.

Edit Source

For UI development – Creates a text data-block with the source code associated with the control, in case the control is based on a Python script. In the Text Editor it points at the code line where the element is defined.

Edit Translation

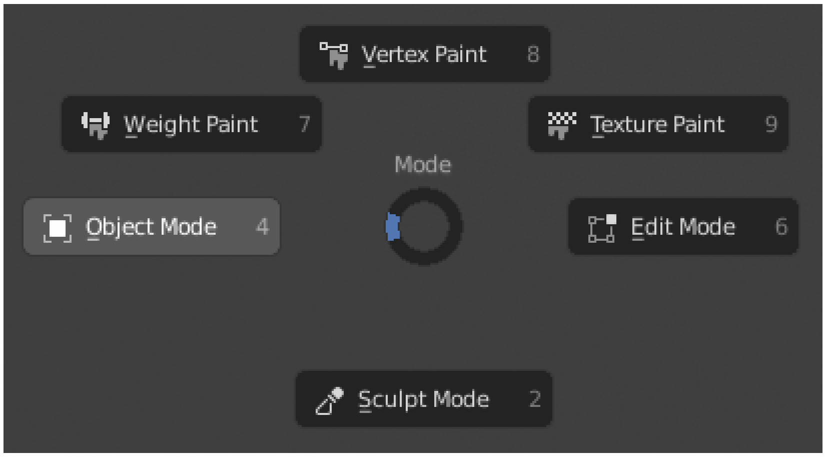
For UI development – Points at the translation code line.

Specials Menu

The Specials pop-up menu is similar to a context menu, but is opened using a button consisting of a down arrow on a dark background ⌄.

Pie Menus

A pie menu is a menu whose items are spread radially around the mouse.



The 3D Viewport Mode Pie menu.

Tip

The fastest way to operate a Pie menu is to press down the key(s) that invoke the menu, move the mouse slightly towards a selection, and release the key(s) to activate the selection.

Releasing the key without moving the mouse will keep the menu open so you can click the desired item. If you do move the mouse before releasing, the item closest to the mouse will be activated instantly.

An open disc widget at the center of the pie menu shows the current direction of the pie menu. The selected item is also highlighted. A pie menu will only have a valid direction for item selection if the mouse is touching or extending beyond the disc widget at the center of the menu.

Pie menu items support key accelerators, which are the letters underlined on each menu item. Number keys can also be used.

If there are sub-pies available, it is indicated by a plus icon.

See also

Pie menu settings.

Eyedropper

The eyedropper (pipette icon) allows you to sample from anywhere in the Blender window. The eyedropper can be used to select different kinds of data:

Color

This is the most common usage. The eyedropper is used to sample a pixel's color from anywhere within Blender.

Note

The View Transform of the color management affects the color. In order to get consistent results, it should be set to *Standard*. If it's set to any other option, the eyedropper may return an inaccurate color.

Color Ramp

Dragging the cursor over the window to sample a line which is converted into a color ramp.

Objects/Object-Data

This is used with object buttons (such as parent, constraints or modifiers) to select an object from the 3D Viewport or Outliner, rather than having to select it from a drop-down.

Bones

This is used when a subtarget to an armature can be chosen. It is possible to choose a bone from the 3D Viewport or from the outliner. Only bones that belong to the armature that was chosen as a target can be picked.

Note

In the 3D Viewport, bones can only be picked if the armature is in Pose Mode or in Edit Mode.

Camera Depth

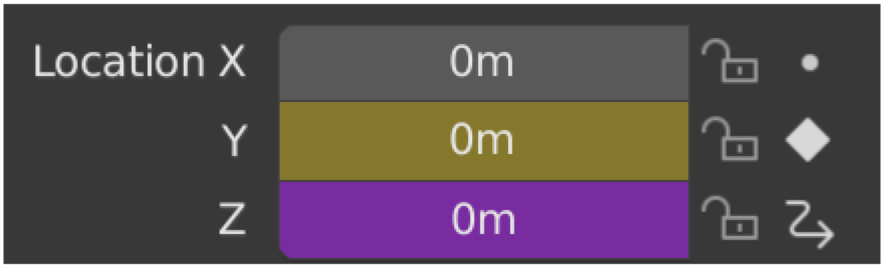
Number fields effecting distance can also use the eyedropper.

This is used to set the camera's depth of field so the depth chosen is in focus.

- `E` will activate the eyedropper while hovering over a button.
- `LMB` dragging will mix the colors you drag over, which can help when sampling noisy imagery.
- `Spacebar` resets and starts mixing the colors again.

Decorators

Decorators are small buttons that appear to the right of other buttons and show the state of the property. Decorators may appear next to number fields, menus, and checkboxes to indicate the property can be animated.



Decorators indicating different property states.

Clicking on the decorator dot icon will add a Keyframe to that property. Clicking the rhombus icon again will remove the keyframe. A solid rhombus icon indicates there is a keyframe on the current frame, while a non-solid rhombus icon indicates that the property has a keyframe on another frame. Clicking the non-solid rhombus icon will create a keyframe on the current frame with the current property value.

If a property is being driven by another, the decorator shows the driver icon.

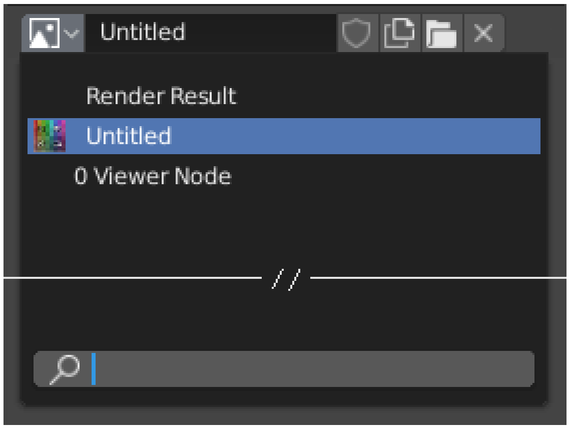
Decorators make it quick and easy to glance over properties and see their state.

See also

State Colors

Data-Block Menu

Lets you select a Data-Block (such as a material) in order to link it to something else (such as an object).



A data-block menu with a search field.

Type

Shows an icon indicating the data-block type. Clicking the image or the down arrow opens the popup menu. Dragging the image lets you apply the data-block to something else. (For example, you can drag a material onto an object in the 3D Viewport to assign it. Dragging onto Data ID fields is also possible.)

List

A list of data-blocks available in the current blend-file, or a link to select an item from. The menu may show a preview besides the items and a search field to search the items in the list by name.

Note

Data-blocks with names that begin with `.` are hidden from the list, unless a string that also starts with `.` is entered into the search field, or the Show Hidden Files/Data-Blocks user preference is enabled.

Name

Displays, and allows editing of, the name of the selected data-block.

User Count

Displays the number of users of the data (if there's more than one user). Clicking it will create a single-user copy.

As an example, if three separate objects referenced the same material, the material's user count would be 3. Changing the material would affect all three objects. If you now selected an object and clicked the user count, the object would receive its very own copy of the material, which can be modified independently of the original that's still used by the other two.

Fake User (shield icon)

If a data-block has no real users, it'll normally be cleaned up (deleted) when saving the blend-file. To prevent this, you can give it a fake user; that way, it's guaranteed to "survive." Data-blocks with a fake user have an "F" prefix in the drop-down list.

The Outliner can show an overview of all data-blocks without real users in the blend-file. Simply change its Display Mode to Orphan Data.

New/Add (files icon)

Creates a new data-block (or duplicates the current one) and selects it.

Open File (folder icon)

Opens the File Browser, for importing an image for example.

Unpack File (bin icon)

Unpack the file packed into the current blend-file to an external one.

(Unlink Data-block)

Clears the link. `Shift-LMB` to set the users to zero allowing the data to be fully deleted from the blend-file.

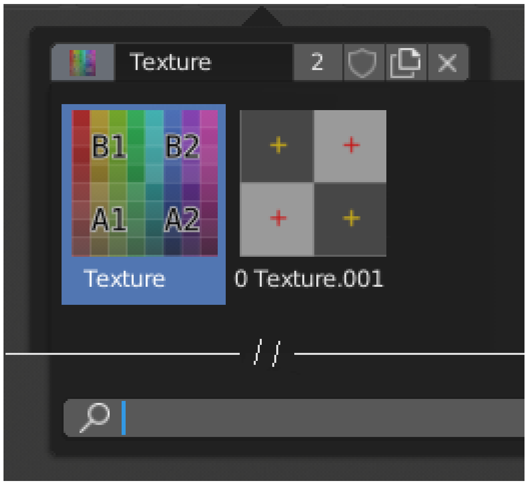
Sometimes there is a list of applied data-blocks (such as a list of materials used on the object).

See also

Data-blocks are discussed further in the Data System chapter.

Preview

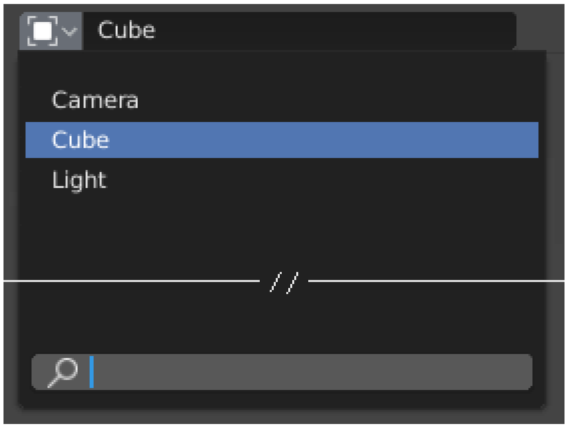
Some data-block menus have large preview images in their drop-down instead of just icons and names.



A Data-Block menu with preview.

Data ID

A Data ID field is similar to a Data Block Menu, but is only for selecting (and not for other features like creating new data or managing users).



A Data ID field.

It can show the following elements:

Type
: The icon on the left specifies the accepted data-block type.

Name
: The text field functions as a search field by matching elements in the list. Press `Tab` to auto-complete names up to the level where a

match is found. If more than one match exists, you have to continue typing. If you type an invalid name, the value will remain unchanged.

List

Lets you select the data-block directly.

Eyedropper

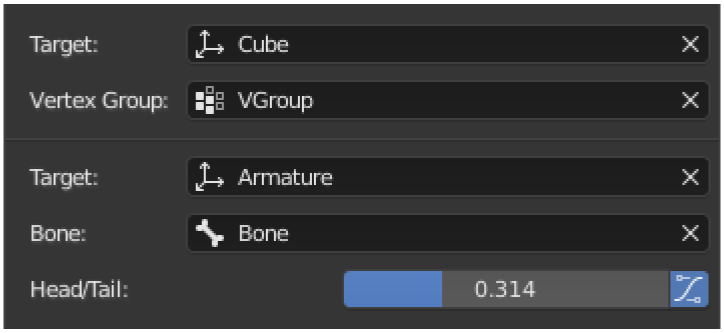
In some Data IDs there is an Eyedropper available through the pipette icon on the right side.

(Clear Button String)

Click the button on the right to clear the reference.

ID Sub-Data

Related types of ID sub-data may become available to select, depending on the data-block type and its intended usage.



Target: Cube

Vertex Group: VGroup

Target: Armature

Bone: Bone

Head/Tail: 0.314

Sub-data Example.

Vertex Group

If the selected Object in the *Target* field is a mesh or a lattice, an additional field may be displayed to select one of its vertex groups.

Bone

If the selected Object in the *Target* field is an armature, an additional field may be displayed to select one of its bones.

Head/Tail

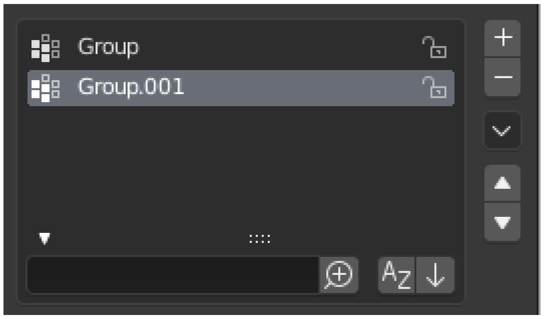
Once a bone is selected, a numeric field may become available for specifying a point along the bone. A value of **0.0** corresponds to the bone's head, while a value of **1.0** corresponds to its tail. Any values between these will result in linear interpolation (so a value of **0.5** matches the bone's center).

Use B-Bone Shape

If the bone is a bendy bone, clicking on this button will make the point follow the curvature of the B-spline between head and tail, rather than simply going in a straight line.

List View

This control is useful for managing lists of items. In addition to the main list, there is a Filtering panel on the bottom (hidden by default) and modification buttons on the right.



List view with expanded Filtering Options panel.

Select

To select an item, click `LMB` on it.

Rename

By double-clicking on an item, you can edit its name via a text field. This can also be achieved by clicking it with `Ctrl-LMB`.

Resize

The list view can be resized to show more or fewer items. Hover the mouse over the handle (::::), then click and drag to expand or shrink the list.

Filter

Click the *Show filtering options* button (triangle on bottom left) to show or hide the filter option panel.

Search `Ctrl-F`

Filters the list to only show items containing a certain term.

Invert <->

Toggle between including items that match the search term and those that do not contain the search term.

Sort by Name

This button switches between alphabetical and non-alphabetical ordering.

Reverse

Sort objects in ascending or descending order. This also applies to alphabetical sorting, if selected.

On the right of the list view are list modification buttons:

Add +

Adds a new item.

Remove –

Removes the selected item.

Specials ∨

A Specials menu with operators to edit list entries.

Move (up/down arrow icon)

Moves the selected item up/down one position.

Color Picker

The color picker is a pop-up that lets you define a color value. Holding `Ctrl` while dragging snaps the hue to make it quick to select primary colors.

Color Picker

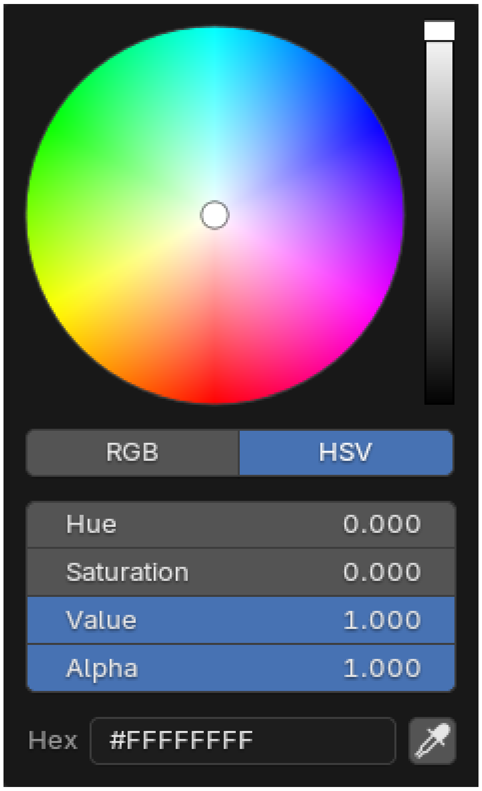
Lets you pick the first and second color component. The shape can be changed; see Types.

Value/Lightness

The slider with a gradient in the background defines the value/lightness of the color mixing. Fine control can be inputted with `Wheel`.

Color Model

Selects the Color Model for the number value fields.



Hue 0.000
Saturation 0.000
Value 1.000
Alpha 1.000
Hex #FFFFFFFF

Circle HSV.

RGB::	Create the final color by mixing red, green, and blue colors.
HSV/HSL::	Create the final color by adjusting hue, saturation, and value/lightness.

Note

In Blender, the RGB and HSV/HSL values are in Scene Linear color space, and are therefore not Gamma corrected. On the contrary, *Hex* are automatically Gamma corrected for the sRGB Color Space. For more information, see Color Management.

Color Values

Blender uses values from 0 to 1.0 to express the color mixing for RGB and HSV/HSL colors.

For color inputs with an Alpha Channel, another slider is added.

Hex

The hexadecimal (hex) equivalent value to the mixed color. Shorthand hex colors are can be typed in, e.g. dark yellow `FFCC00` can be written as `FC0`.

Eyedropper (pipette icon)

Samples a color from inside the Blender window using the Eyedropper. Note, colors sampled from the eyedropper are in linear color space and do not account for view transform adjustments.

Shortcuts

- `Ctrl-LMB` (drag) snaps the hue to 30° intervals.
- `Shift-LMB` (drag) precision motion.
- `Wheel` adjust the value/lightness.
- `Backspace` reset the value to the default value.

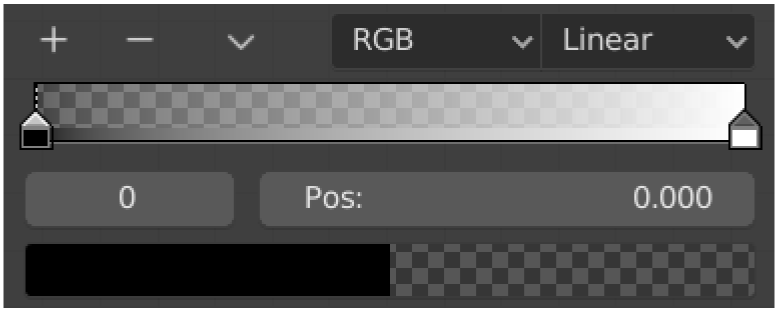
Types

The default color picker type can be selected in the Preferences, see: Interface.

Color Picker types.

Color Ramp Widget

Color Ramps specify a color gradient based on color stops. Each stop has a position and a color. The gradient is then calculated as the interpolation between these stops using the chosen interpolation method.



RGB

Linear

0

Pos: 0.000

Color ramp.

Controls

Add +

Adds a new stop between the selected stop and the one before it.

Delete –

Deletes the selected color stop.

Specials ∨

Contains more operators for the color ramp.

Flip Color Ramp

Flips the gradient, mirroring the positions of the stops.

Distribute Stops from Left

Distribute the stops so that every step has the same space to the right. This is mostly useful when used with Constant interpolation mode.

Distribute Stops Evenly

Distribute the stops so that all neighbors have the same space between them.

Eyedropper (pipette icon) E

An Eyedropper to sample a color or gradient from the interface to be used in the color ramp.

Reset Color Ramp

Resets the color ramp to its default state.

Color Mode

Selection of the Color Model used for interpolation.

RGB::	Blends color by mixing each color channel and combining.
HSV/HSL::	Blends colors by first converting to HSV or HSL, mixing, then combining again. This has the advantage of maintaining saturation between different hues, where RGB would de-saturate. This allows for a richer gradient.

Color Interpolation

The interpolation method to use across the ramp.

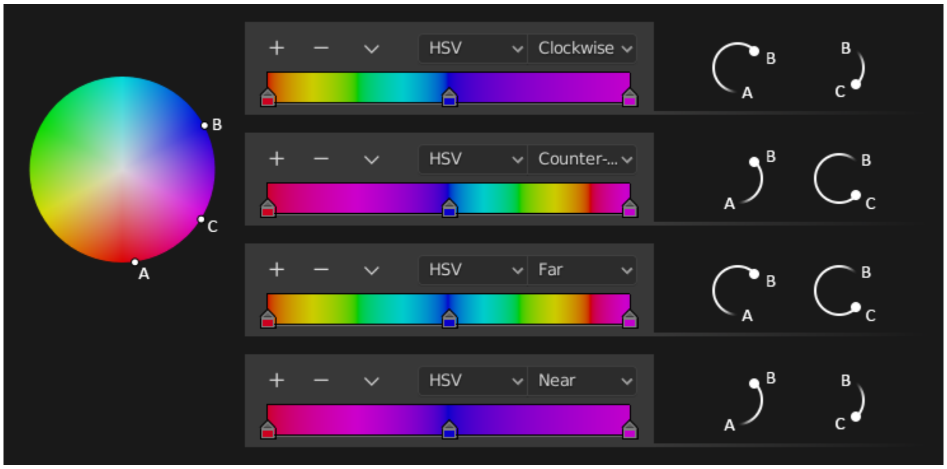
RGB

B-Spline::	Uses a B-spline interpolation for the color stops.
Cardinal::	Uses a cardinal interpolation for the color stops.
Linear::	Uses a linear interpolation for the color stops.
Ease::	Uses an ease interpolation for the color stops.
Constant::	Uses a constant interpolation for the color stops.

HSV/HSL

Clockwise::	Clockwise interpolation around the HSV/HSL wheel.

Counter-Clockwise::	Counterclockwise around the HSV/HSL wheel.
Near::	Nearest route around the wheel.
Far::	Furthest route around the wheel.



HSV and HSL interpolation options.

Active Color Stop

Index of the active color stop (shown as a dashed line). Offers an alternative way of selecting a stop in case it’s so close to others that it’s hard to select it directly.

Position

This slider controls the position of the selected color stop in the range.

Color

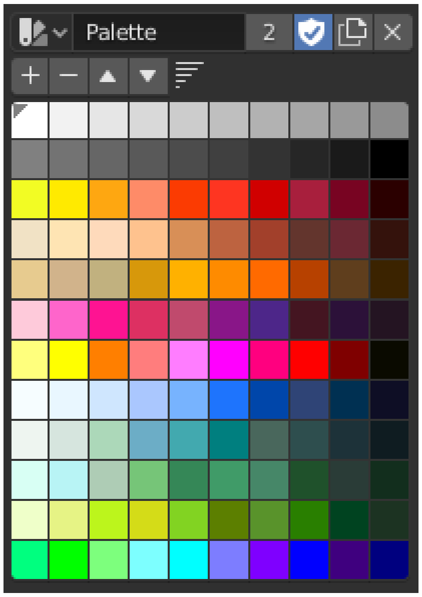
A color field where you can specify the color and alpha of the selected stop.

Shortcuts

- `LMB` (drag) moves color stops.
- `Ctrl-LMB` (click) adds a new color stop.

Color Palette

Color Palettes are a way of storing a brush's color so that it can be used at a later time. This is useful when working with several colors at once.



Color Palette.

Palette
: A [Data-Block Menu](#) to select a palette.

New +
: Adds the current brush's primary *Color* to the palette.

Delete –
: Removes the currently selected color from the palette.

Move (up/down arrow icon)
: Moves the selected color up/down one position.

Sort
: Sort Colors by Hue, Saturation, Value, Luminance.

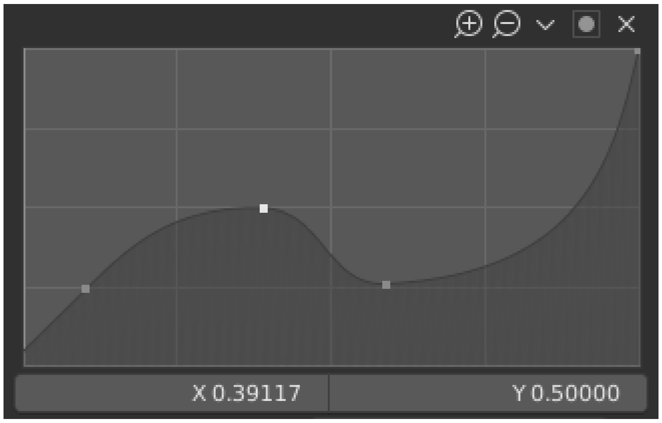
Color List
: Each color that belongs to the palette is presented in a list. Clicking on a color will change the brush's primary *Color* to that color.

Shortcuts

- `Ctrl-LMB` open the color picker to change color. See [Color Picker](#).
- `Backspace` reset the value.

Curve Widget

The *Curve Widget* allows to intuitively map a range of input values to a set of output values by adjusting a curve, where the X axis represents the input and the Y axis the output.


X 0.39117
Y 0.50000

Curve widget.

Control Points

Like all curves in Blender, the curve of the *Curve Widget* is controlled using *control points*.

By default, there are two control points: one at (0.0, 0.0) and one at (1.0, 1.0), meaning the input is mapped directly to the output (unchanged).

Move
Simply click and drag it around.

Add
Click anywhere on the curve where there is not already a control point.

Remove
Select it and click the button at the bottom right.

Controls

Above the curve graph is a row of controls. These are:

Zoom In (plus magnifying glass icon)

Zoom into the center of the graph to show more details and provide more accurate control. To navigate around the curve while zoomed in, click and drag in an empty part of the graph.

Zoom Out (minus magnifying glass icon)

Zoom out of the graph to show fewer details and view the graph as a whole. You cannot zoom out further than the clipping region (see *Clipping* below).

Specials v

A Specials menu with operators to edit control points or to set properties.

Reset View

Resets the view of the curve.

Extend Options

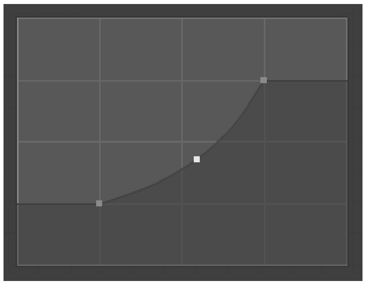
Controls how the curve is extended before the first control point and after the last control point.

Extend Horizontal

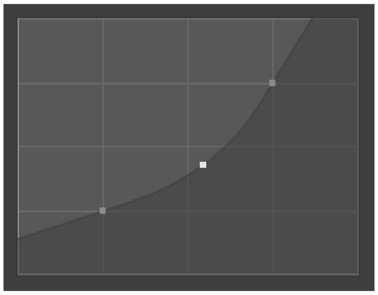
Causes the curve to stay horizontal before the first point and after the last point.

Extend Extrapolated

Causes the curve to extrapolate before the first point and after the last point, based on the shape of the curve.



Extend Horizontal.



Extend Extrapolated.

Reset Curve

Resets the curve to default (removes all points added to the curve).

Clipping Options (dot icon)

Use Clipping

Forces curve points to stay between specified values.

Min X/Y and Max X/Y

Set the minimum and maximum bounds of the curve points.

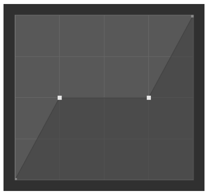
Below the curve are options for the selected control point:

Handle Type

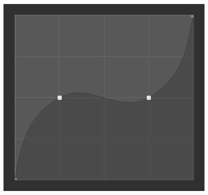
Controls how the control points affect the curve shape. It determines the interpolation of the curve segment at the selected control point.

Vector Handle::	Vector handles create straight lines and sharp corners.
Auto Handle::	Automatic handles that create smooth curves.
Auto-Clamped Handle::	Automatic handles that create smooth curves while also preventing overshoot.
Free Handle::	The handles can be moved completely independently, and thus can result in a sharp change of direction.
Aligned Free Handles::	

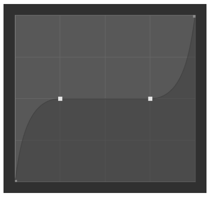
The two handles of the curve point are locked together to always point in exactly opposite directions. This results in a curve that is always smooth at the control point.



Vector Handles.



Auto Handles.



Auto Clamped Handles.

X, Y
: The coordinates of the selected control point.

Delete
: Remove the selected control point. The first and last points cannot be deleted.

Copy/Paste `Ctrl-C`, `Ctrl-V`
: The whole curve can be copied from one Curve Widget to another by hovering over the curve graph and pressing `Ctrl-C`, `Ctrl-V`.

Tools & Operators

- Tool System
- Operators
- Undo & Redo
- Annotations
- Selecting

Tool System

Tools are accessed from the Toolbar.

This is a general introduction to tools. Individual tools have their own documentation.

There can only be one active tool per Workspace and mode. This tool is remembered: if you're in Edit Mode and have the Extrude tool selected, then switch to Object Mode (which has no Extrude tool) and back to Edit Mode, the Extrude tool will still be active.

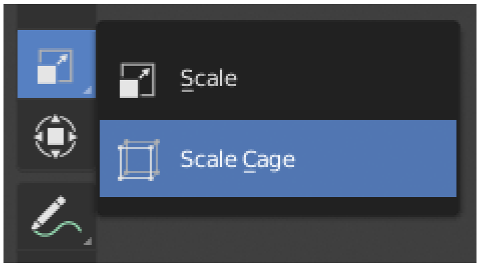
Most tools are controlled using just `LMB`, though some also have modifier keys (shown in the Status Bar while using the tool). This can all be customized in the Keymap Preferences.

Some tools define gizmos (*Shear* and *Spin* for example) to help control them.

Toolbar

Reference

Shortcut:: `T`



Expanded tool group.

The Toolbar contains buttons for the various tools. Buttons with a small triangle in their bottom right corner are tool groups which can be opened by holding `LMB` on them for a moment (or dragging `LMB` to open them instantly).

Hovering your cursor over a tool for a short time will show its name, while hovering longer will show the full tooltip.

Resizing the Toolbar horizontally will display the icons with two columns. Expanding it further will display the icon and its text.

Pop-Up Toolbar

Reference

Shortcut:: `Shift-Spacebar`

Pressing `Shift-Spacebar` will pop up a small toolbar right at your cursor for faster access. The shortcuts for selecting the tools are displayed on the right.

Alternatively, you can map this action to `Spacebar` in the Keymap Preferences. Then you'll be able use `Spacebar` like a modifier key (similar to holding `Ctrl` or `Shift`). For example, you can press `Spacebar T` for Transform, `Spacebar D` for Annotate, `Spacebar M` for Measure and so on. See Spacebar Action.

Quick Favorites

Reference

Shortcut:: `Q`

The Quick Favorites menu gathers your favorite tools. Any tool or menu item can be added to this pop-up menu via its context menu.

Changing Tools

If you have *Alt Click Tool Prompt* enabled in the Keymap Preferences, tapping `Alt` will display a tool prompt in the Status Bar. You can then press a key to select the corresponding tool, or tap `Alt` again to cancel the prompt.

Fallback Tool

The fallback tool is the one that's selected by default (so the one at the top of the Toolbar). You can change it by either holding `LMB` on the toolbar button or pressing `Alt-W` to get a pie menu.

Cycling Tools

If you bind a key to a tool which is part of a group, you can enable the *Cycle* option in the keymap editor. Successive presses will then cycle through the tools in that group.

This is enabled by default for the selection tools in the 3D Viewport, for example: pressing `W` will cycle between Select Box, Select Circle and so on.

Properties

Tools can have their own settings, which are available from multiple places:

- The *Tool* ▸ *Active Tool* panel in the Sidebar `N`.
- The *Active Tool* tab in the Properties editor.
- The *Tool Settings* region below the area header.

Operators

Operators execute an action the moment they're activated, which makes them different from tools (which require some sort of input). Operators can be started from Operator Buttons, Popup Menus, or Menu Search. Examples of operators include adding a new object, deleting it, or setting its shading to smooth.

Operator Properties

Most operators have properties that can be adjusted to refine their result. First run the operator (which will use its default settings), then adjust the properties in the Adjust Last Operation region.

Modal Operators

Modal operators exist as a concept in between Tools and regular operators. They require some sort of interactive input.

The action of a modal operator can be confirmed using `LMB` or `Return`. To cancel a modal operator use `RMB` or `Esc`.

Slider Operators

Slider operators are used to interactively adjust a percentage value in the editor's Header.

You can adjust the percentage by dragging the slider left or right. This can be made coarser (snapping in 10% increments) by holding `Ctrl` and more precise by holding `Shift`. For some sliders, you can toggle "overshoot" with `E`, which lets you go beyond the 0-100% range.

Searching for Operators

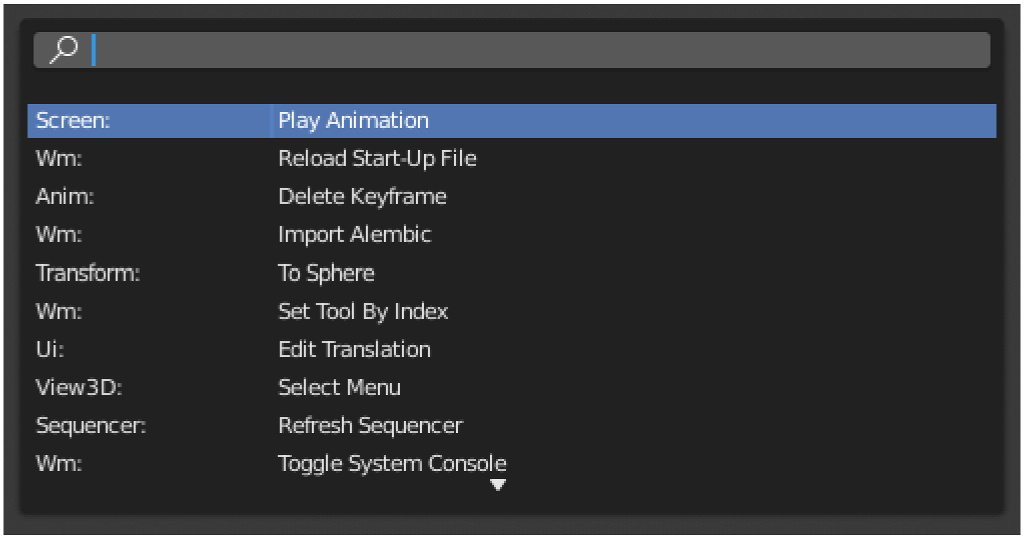
Menu Search

Reference

Mode:: All Modes
Menu:: *Edit ‣ Menu Search*
Shortcut:: `F3`

The Menu Search pop-up lets you search Blender’s interface for a certain operator and execute it. First narrow down the list by typing (part of) the operator’s name, then either click the operator with `LMB`, or navigate to it with `Down` and `Up` and activate it with `Return`.

Apart from the operator names, the pop-up also shows the menus where they’re located.



Screen:	Play Animation
Wm:	Reload Start-Up File
Anim:	Delete Keyframe
Wm:	Import Alembic
Transform:	To Sphere
Wm:	Set Tool By Index
Ui:	Edit Translation
View3D:	Select Menu
Sequencer:	Refresh Sequencer
Wm:	Toggle System Console

The Menu Search pop-up.

See also

The Spacebar Action option in the Preferences.

Operator Search

Reference

Mode:: All Modes
Menu:: *Edit ‣ Operator Search*

When Developer Extras are activated, the Operator Search can be accessed from the Edit menu in the Topbar. This menu searches all Operators within Blender, even if they are not exposed in a menu. This is useful for Python developers for testing purposes. Blender might also include a few advanced operators that are not exposed in a menu and can only be accessed via this search menu.

See also

The User Preferences has an option to change how the search results are scored.

Undo & Redo

The tools listed below will let you roll back an accidental action, redo your last action, or let you choose to recover to a specific point, by picking from a list of recent actions recorded by Blender.

Undo

Reference

Mode:: All Modes
Menu:: *Edit ▸ Undo*
Shortcut:: `Ctrl-Z`

If you want to undo your last action, just press `Ctrl-Z`.

See also

Memory & Limits Preferences to change undo settings.

Redo

Reference

Mode:: All Modes
Menu:: *Edit ▸ Redo*
Shortcut:: `Shift-Ctrl-Z`

To roll back the Undo action, press `Shift-Ctrl-Z`.

Adjust Last Operation

Reference

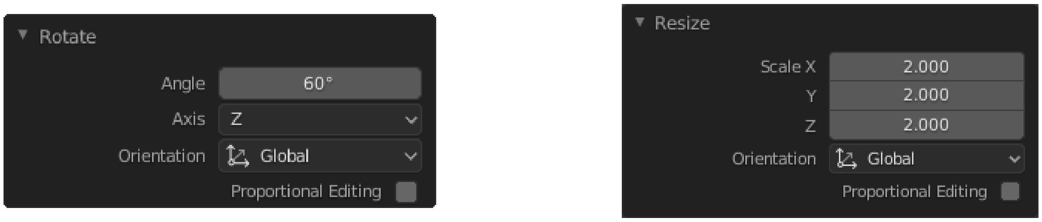
Mode:: All Modes
Menu:: *Edit ‣ Adjust Last Operation…*
Shortcut:: `F9`

You can tweak the parameters of an operator after running it. In editors that support it, there is a “head-up display” panel in the bottom left based on the last performed operation. Alternatively, you can create a pop-up with `F9` which does the same thing.

For example, if your last operation was a rotation in *Object Mode*, Blender will show you the last value changed for the angle (see Fig. Rotation (Object Mode, 60 degrees). left), where you can change your action back completely by typing `Numpad0` in the *Angle* Field. There are other useful options, based on the operator, and you cannot only Undo actions, but change them completely using the available options.

If you are in *Edit Mode*, Blender will also change its contents based on your last action taken. In the second example (on the right), the last operation was a Move in Object Mode; but a *Scale* on a Face in Edit Mode, and, as you can see, the contents of *Adjust Last Operation* are different, because of the mode (Edit Mode) (See Fig. Scale (Edit Mode, Resize face). right).

Adjust Last Operation.



Rotate
Angle: 60°
Axis: Z
Orientation: Global
Proportional Editing ☐

Rotation (Object Mode, 60 degrees).

Resize
Scale X: 2.000
Y: 2.000
Z: 2.000
Orientation: Global
Proportional Editing ☐

Scale (Edit Mode, Resize face).

Tip

Some operations produce particularly useful results by using *Adjust Last Operation*. For example, adding a Circle in the 3D Viewport; if you reduce the *Vertices* to three, you get a perfect equilateral triangle.

Tip

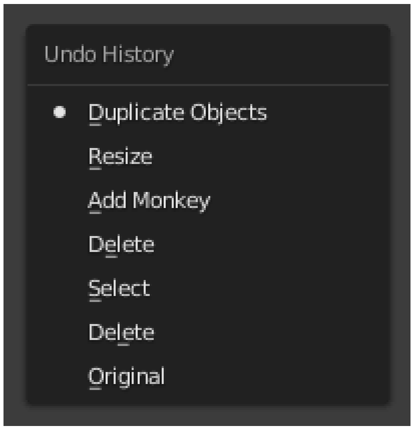
The *Adjust Last Operation* region can be hidden by *View ▸ Adjust Last Operation*.

Undo History

Reference

Mode::	All Modes
Menu::	*Edit ▸ Undo History*

There is also an Undo History of the last actions taken, recorded by Blender.



The Undo History menu.

The top of the list corresponds to the most recent actions. A small icon of a dot next to one of the entries indicates the current status. Rolling back actions using the *Undo History* feature will take you back to the action you choose. Much like how you can alternate between going backward in time with *Undo* and then forward with *Redo*, you can hop around on the Undo timeline as much as you want as long as you do not make a new change. Once you do make a new change, the Undo History is truncated at that point. Selecting one of the entries in the list takes the current status to that position.

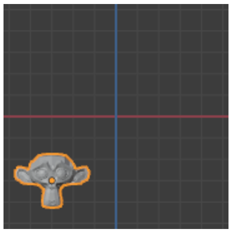
Repeat Last

Reference

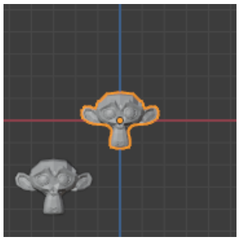
Mode:: All Modes
Panel:: *Edit ‣ Repeat Last*
Shortcut:: `Shift-R`

The Repeat Last feature will repeat your last action when you press `Shift-R`.

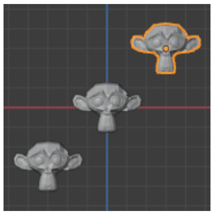
In the example images below, we duplicated a *Monkey* mesh and moved it a bit. Using repeat `Shift-R`, the *Monkey* was duplicated and moved a second time.



Suzanne.



After a `Shift-D` and move.



After a `Shift-R`.

Repeat History

Reference

Mode:: All Modes
Menu:: *Edit ‣ Repeat History…*

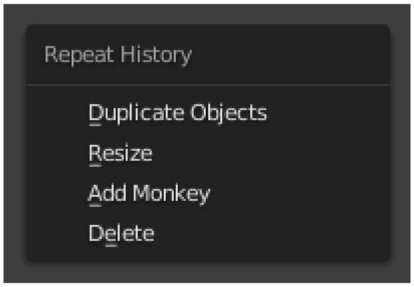
The *Repeat History* feature will present you a list of the last repeated actions, and you can choose the actions you want to repeat. It works in the same way as the Undo History, explained above, but the list contains only repeated actions.

Important

When you quit Blender, the complete list of user actions will be lost, even if you save your file before quitting.

See also

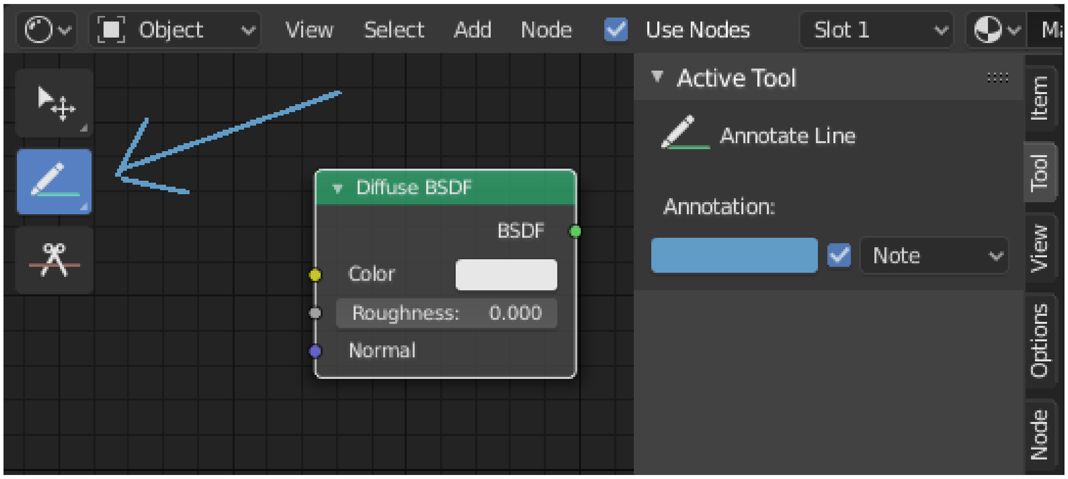
Troubleshooting section on [Recovering your lost work](#).


Repeat History
Duplicate Objects
Resize
Add Monkey
Delete

The Repeat History menu.

Annotations

The annotation tool is available in multiple editors. It can be used to add notes to e.g. 3D objects or node setups. The arrow in the screenshot below is an annotation.


Object
View
Select
Add
Node
Use Nodes
Slot 1
Mi
Active Tool
Annotate Line
Annotation:
Note
Item
Tool
View
Options
Node
Diffuse BSDF
BSDF
Color
Roughness: 0.000
Normal

Annotations tool in a node editor.

Annotation Tools

The annotation tool can be activated in the Toolbar and has the following sub-tools:

Annotate
: Draw free-hand strokes in the main area.

Annotate Line
: Click and drag to create a line. Optionally, you can select the arrow style for the start and end of the line.

Annotate Polygon
: Click multiple times to create multiple connected lines, then press `Return` or `Esc` to confirm.

Annotate Eraser

Click and drag to remove lines. The eraser has a *Radius* setting found in *Tool Settings*.

Tool Settings

Common

Color

Adjust the color of existing and new strokes.

Annotation Layer

A pop-over menu, showing the name of the current layer, to access the Annotation Layers.

Placement

Determines where the annotations are drawn.

3D Cursor::	Only available in the 3D Viewport. The new annotations become part of the 3D scene; they're drawn on an imaginary plane that goes through the 3D Cursor and is aligned to your view.
Surface::	Only available in the 3D Viewport. The new annotations become part of the 3D scene; they're drawn onto the surface of the object under the mouse. If there is no surface, you get the same behavior as *3D Cursor*.
Image::	Only available in 2D editors such as the Image Editor. The annotations become part of the 2D space, meaning their position and size change as you pan and zoom in the editor.
View::	The new annotations are 2D and get stuck to the screen. They keep the same position, rotation and size no matter how you pan, orbit or zoom in the editor.

Only End Points *Surface Placement*

Only use the first and last parts of the stroke for snapping.

Project Onto Selected *Surface Placement*
Only project the strokes onto selected objects.

Stabilize Stroke
Helps to reduce jitter of the strokes while drawing by delaying and correcting the location of points.

Radius
Minimum distance from the last point before the stroke continues.

Factor
A smooth factor, where higher values result in smoother strokes but the drawing sensation feels like as if you were pulling the stroke.

Annotate Line

Style Start, End
The decoration to use at the beginning or end of the line segment. This can be used for example to create arrows to point out specific details in a scene.

Annotation Layers

When the annotation tool is enabled, the settings for managing multiple layers can be found in the *Sidebar* ‣ *View* ‣ *Annotations* panel.

Opacity
Adjusts the opacity of existing and new strokes.

Thickness
Adjusts the thickness of existing and new strokes.

Onion Skin

Shows a ghosted image of strokes made in frames before and after the current frame. Onion skinning only works in the 3D Viewport and Sequencer. See the Grease Pencil documentation for an explanation of Onion Skinning.

Before/After

Color to use before and after the current frame on ghost frames. The number defines how many frames to show before and after the current frame.

Selecting

By default, Blender uses `LMB` to select items. This can be changed to `RMB` in the Preferences.

Blender has several selection tools that can be used across the different editors.

Note

Some editors deviate from the keyboard shortcuts shown below. For example, most editors use `Shift-LMB` to add a single item to the selection, but the Outliner uses `Ctrl-LMB`. Similarly, most editors use `Ctrl-RMB` for performing a *Lasso Select*, but node editors use `Ctrl-Alt-LMB`.

Most selection tools come in two variants, where one variant is available in the Toolbar and the other in the *Select* menu. While the variants' names are almost identical (such as *Select Box* in the Toolbar versus *Box Select* in the menu), the way they work is a bit different. New users coming from other applications will find the Toolbar variants to be the most familiar.

Toolbar Selection Tools

All the Toolbar selection tools behave the same when clicking an item: they select it (and deselect any previously selected items). If you hold `Shift` while clicking, the item will be added to the selection (if it's not selected) or removed from the selection (if it is selected).

What makes the tools different is what happens when you drag.

Tweak

Reference

Tool:: *Toolbar ▸ Tweak*
Shortcut:: `W`

Dragging an item will move it around.

Select Box

Reference

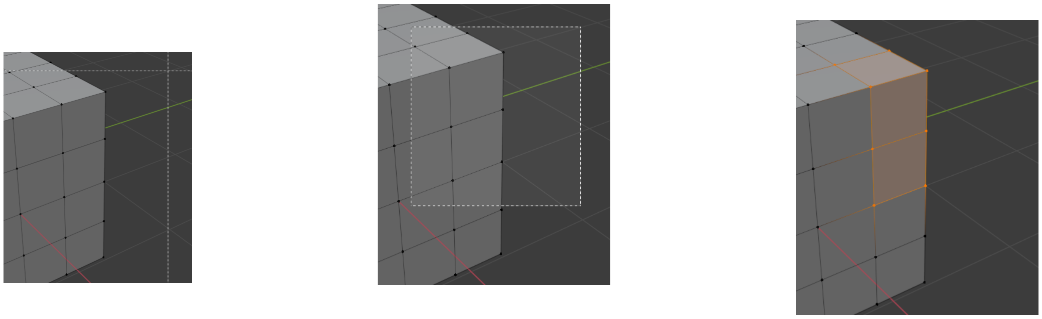
Tool:: *Toolbar ▸ Select Box*
Shortcut:: `W`

Dragging will create a rectangle, and select all the items that are partially or completely inside it once you release. (Any other items will be deselected.)

Holding `Shift` while dragging will add the items to the selection. Holding `Ctrl` will remove them.

While dragging, you can additionally hold `Spacebar` to move the rectangle around with the mouse.

Select Box example (Edit Mode).



Start.

Selecting vertices.

Complete.

Select Circle

Reference

Tool:: *Toolbar ‣ Select Circle*
Shortcut:: `W`

Dragging will select all the items which the circle passed over. Items which you didn't pass over will be deselected.

Holding `Shift` while dragging will add the items to the selection. Holding `Ctrl` will remove them.

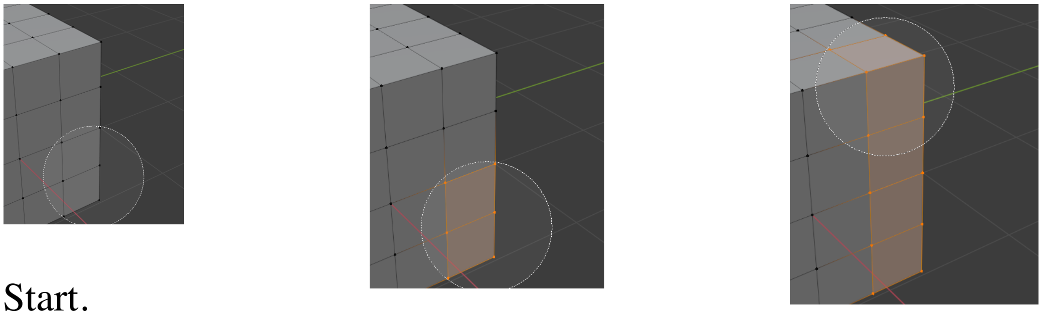
You can change the radius of the circle in the tool settings (which can be found in the area header, the Tool tab of the Sidebar `N`, or the Active Tool tab of the Properties editor).

Note

In Object Mode: unlike *Select Box*, which selects objects as soon as the box covers any part of their geometry, *Select Circle* only selects objects if the circle passes over their origin point. The origin is shown as an orange dot for selected objects but is invisible for unselected ones, unless "Origins (All)" is enabled in the Viewport Overlays.

This difference in behavior does not apply to the other modes (like Edit Mode and Pose Mode).

Select Circle example (Edit Mode).



Start.

Complete.

Selecting vertices.

Select Lasso

Reference

Tool:: *Toolbar ‣ Select Lasso*
Shortcut:: `W`

Dragging will create a freeform shape, and select all the items inside it once you release. (Any other items will be deselected.)

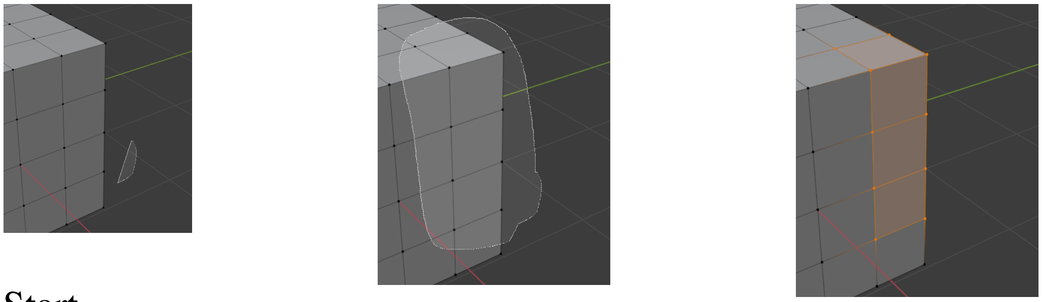
Holding `Shift` while dragging will add the items to the selection. Holding `Ctrl` will remove them.

While dragging, you can additionally hold `Spacebar` to move the shape around with the mouse.

Note

Select Lasso behaves the same as *Select Circle* in that it only looks at origin points in Object Mode.

Select Lasso example (Edit Mode).



Start.

Selecting vertices.

Complete.

Selection Modes

Reference

Tool::	Select Tools
Panel::	*Tool Settings ‣ Mode*

Each of the Toolbar selection tools has a mode to configure how it interacts with existing selections. Note that not every tool supports all of these modes.

Set
: Sets a new selection (the previous selection is discarded). This is the default.

Extend
: Adds newly selected items to the existing selection.

Subtract
: Removes newly selected items from the existing selection.

Invert `Ctrl-I`
: Inverts the selection (unselected items become selected and vice versa).

Intersect
: Selects items that intersect with the existing selection.

Menu Selection Tools

These tools are variants of the previously described ones. They're available in the menu rather than the Toolbar and work slightly differently.

Box Select

Reference

Menu:: *Select ‣ Box Select*
Shortcut:: `B`

To use this tool, you first activate the menu item or keyboard shortcut and then drag a box as usual. Unlike *Select Box*, the default behavior here is to add the items inside the box to the selection. (The ones outside the box are not deselected.)

To remove the items inside the box from the selection, hold `Shift`, or drag with `MMB` instead.

While dragging, you can additionally hold `Spacebar` to move the box around with the mouse.

Circle Select

Reference

Menu:: *Select ‣ Circle Select*
Shortcut:: `C`

To use this tool, you first activate the menu item or keyboard shortcut and then drag a circle around as usual. Unlike *Select Circle*, the default behavior here is to add the items inside the circle to the selection. (The ones outside the circle are not deselected.)

To remove the items inside the circle from the selection, hold `Shift`, or drag with `MMB` instead.

You can change the radius of the circle by scrolling with the `Wheel` or using the `NumpadPlus` and `NumpadMinus` keys.

Once activated, *Circle Select* stays active: you can release the mouse button and start dragging somewhere else without having to press `C` again. At the same time, however, it blocks all other parts of Blender while it’s active. To deactivate the tool again, press `RMB`, `Return`, or `Esc`.

Lasso Select

Reference

Menu::	*Select ‣ Lasso Select*
Shortcut::	`Ctrl-RMB`

To use this tool, you first activate the menu item and drag a freeform shape around the item(s) you want to select with `LMB`. The menu lets you choose whether to set, extend or reduce the selection.

Alternatively, you can immediately start dragging with `Ctrl-RMB`. Unlike *Select Lasso*, the default behavior then is to add the items inside the lasso to the selection. (The ones outside the lasso are not deselected.)

To remove the items inside the lasso from the selection, drag with `Shift-Ctrl-RMB` instead.

While dragging, you can additionally hold `Spacebar` to move the lasso around with the mouse.

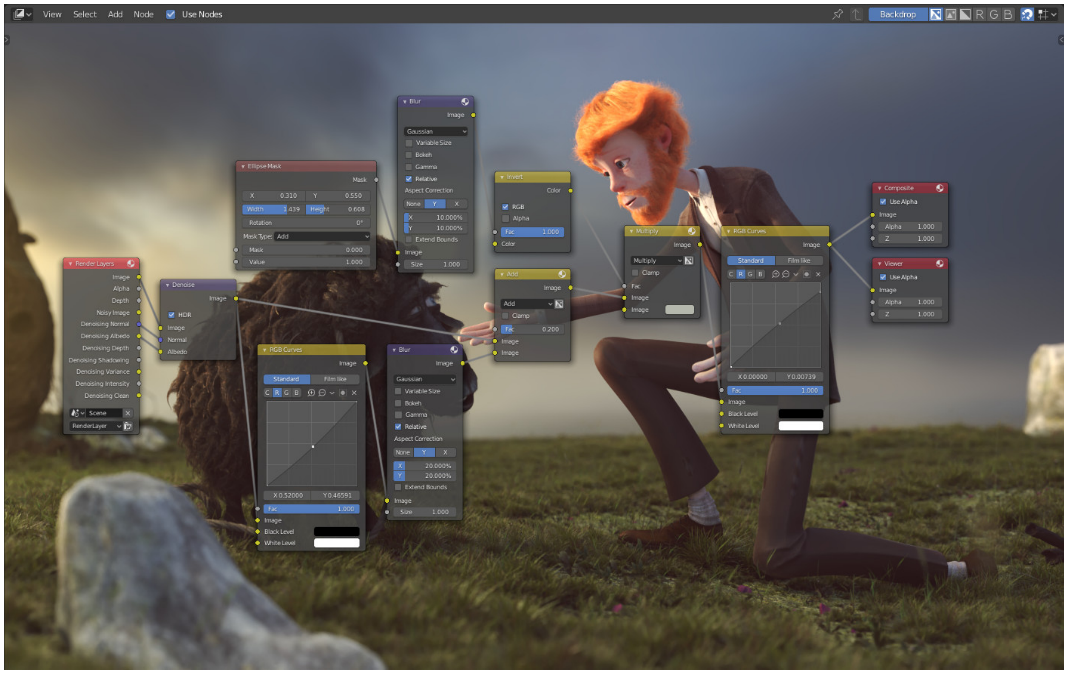
Nodes

- Introduction
    - Editor Interface
    - Navigating
    - Adding Nodes
- Node Parts
    - Title
    - Sockets
    - Properties
- Selecting
- Arranging Nodes
    - Snapping
    - Auto-Offset
- Editing
    - Transform
    - Connecting Sockets
    - Disconnecting Sockets
    - Copy/Paste
    - Duplicate
    - Duplicate Linked
    - Delete
    - Mute
    - Show/Hide
    - Layers
    - Connect to Output
- Sidebar
    - Node
    - Tool
    - View
- Node Groups
    - Properties
    - Make Group
    - Insert Into Group
    - Edit Group

    - Ungroup
    - Reusing Node Groups
- Frame Node
    - Properties
    - Editing
- Reroute Node
    - Properties

Introduction

Blender contains different node-based editors with different purposes, so this section only explains how to work with nodes in general. The list below shows the different types of nodes and where they're documented.



Example of a node editor.

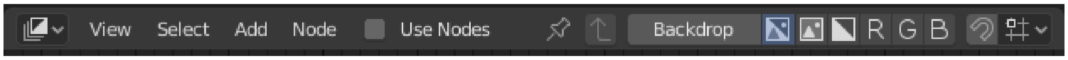
Icon	Name	Description
	Geometry Nodes	Used for procedural modeling.
	Shader Nodes	Used to create materials for objects.
	Composite Nodes	Used to edit rendered images.

Icon	Name	Description
	Texture Nodes	Used to create custom textures.

Editor Interface

Header

The *Header* contains various menus, buttons and options, partially based on the current node tree type.



Common node editor header options.

View
This menu changes your view of the editor.

Select
This menu allows you to select a node or groups of nodes.

Add
This menu allows you to add nodes.

Node
This menu allows you to do things with selected nodes.

Use Nodes
Tells the render engine to use the node tree when computing the material color or rendering the final image, or not. If not, the tree is ignored. For materials, this is mostly a legacy option, because in the past materials could not be created with node trees.

Pin

When enabled, the editor will retain the material or texture, even when the user selects a different object. A node tree can then be edited independent of the object selection in the 3D Viewport.

Parent Node Tree
: Leaves the current node group and returns to the parent node group/tree.

Snapping
: Change options for snapping node positions to achieve a cleaner node tree layout. See Arranging Nodes.

Overlays

Overlays are information that is displayed on top of the nodes and node trees. There is a toggle to show or hide all overlays for the node editor next to the overlay popover.

Wire Colors
: Color node links based on their connected sockets.

Reroute Auto Labels
: Label Reroute Nodes based on the label of connected reroute nodes.

Context Path
: Display breadcrumbs in the upper left corner indicating the hierarchy location of the node tree/group that's currently being displayed.

Annotations
: Displays Annotations in the preview region.

Previews
: Display each node's Preview if the node's preview is also toggled.

Timings
: Display each node's last execution time. This option is only available for compositing and geometry nodes.

In the context of geometry nodes, see Node Timings Overlay.

Toolbar

The *Toolbar* contains a set of tools that can be used in the node editor.

Sidebar

The Sidebar region contains properties for the currently selected node as well as node editor-specific settings.

Navigating

Navigating the node editors is done with the use of both mouse movement and keyboard shortcuts.

Pan `MMB`
: Move the view up, down, left and right.

Zoom `Ctrl-MMB`, `Wheel`
: Move the camera forwards and backwards.

Frame Selected `NumpadPeriod`
: Adjusts the zooms to fit only the selected nodes in the view.

Frame All `Home`
: Adjusts the zoom to fit all nodes in the view.

Adding Nodes

Reference

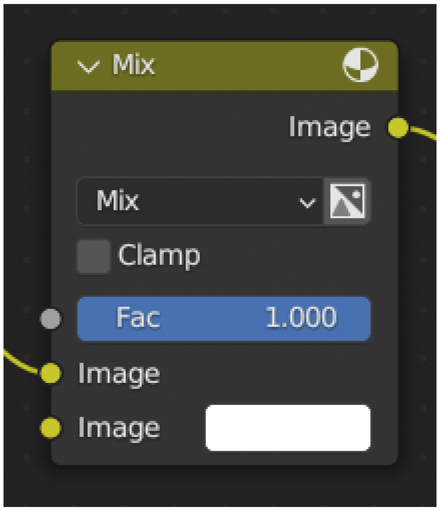
Menu::	*Add*
Shortcut::	`Shift-A`

Nodes are added via the *Add* menu in the editor's header or using a keyboard shortcut.

Nodes can also be added by dragging a connection from an existing node's input or output socket and dropping the connection above an empty space instead of connecting to another socket. This action will open a search menu with a list of compatible nodes and their sockets that can be added and connected to the existing node. Confirming the menu selection will add the node which can then be moved and placed.

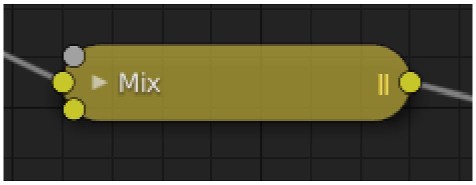
Node Parts

All nodes in Blender are based on a similar construction. This applies to any type of node. These parts include the title, sockets, properties and more.



Title

The title shows the name/type of the node; it can be overridden by changing the node's Label. On the left side of the title is the *collapse* toggle which can be used to collapse the node. This can also be done with `H`.



How a node appears when collapsed.

Preview

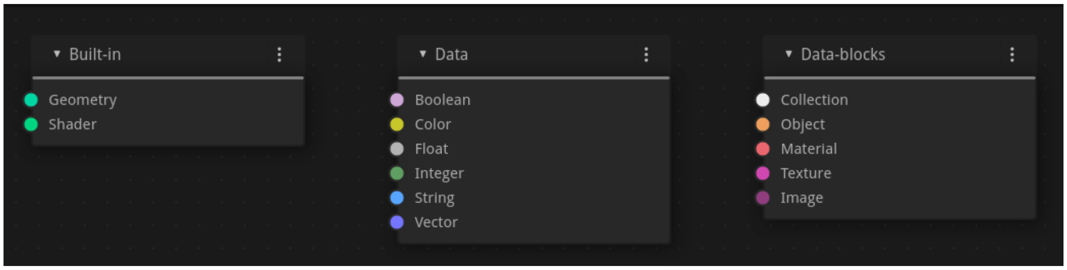
Previews are an overlay that shows a small image above the node displaying the node result. Not all nodes support previews, but the ones that do can be toggled using the / icons in the top right-hand corner of the node next to the title.

Previews can be disabled for the whole node tree by using Previews overlay toggle.

Sockets

Sockets are input and output values for the node. They appear as little colored circles on either side of the node. Unused sockets can be hidden with `Ctrl-H`.

Each socket is color-coded depending on what type of data it handles.


▾ Built-in
Geometry
Shader
▾ Data
Boolean
Color
Float
Integer
String
Vector
▾ Data-blocks
Collection
Object
Material
Texture
Image

Built-in

Shader (bright green)

Used for shaders in Cycles and EEVEE.

Geometry (turquoise)

Used in Geometry Nodes.

Data

Boolean (light pink)

Used to pass a true or false value.

Color (yellow)

Indicates that the socket accepts/produces color information. The colors may or may not have an alpha component depending on the node tree type.

Float (gray)

Indicates that the socket accepts/produces floating-point numbers. It can either be a single value or a so-called “value map”. (You can think of a value map as a grayscale image where the brightness of a pixel represents its value.) If a single value is used as an input for a “value map” socket, all points of the map are set to this same value.

Integer (lime green)

Used to pass an integer value (a number without a fractional component).

String (light blue)

Used to pass a text value.

Vector (dark blue)

Indicates vector, coordinate and normal information.

Rotation (pink)

Indicates a rotation/quaternion.

Matrix (dark pink)

Indicates a 4×4 matrix of float values, it is often used to represent a Transformation Matrix.

Data-Blocks

Collection (white)

Used to pass a collection data-block.

Object (orange)

Used to pass an object data-block.

Material (salmon)

Used to pass a material data-block.

Texture (pink)

Used to pass a texture data-block.

Image (apricot)
Used to pass an image data-block.

Inputs

The inputs are located on the bottom left side of the node, and provide the data the node needs to perform its function. Each input socket, except for the green shader input, when disconnected, has a default value which can be edited via a color, numeric, or vector interface input. In the screenshot of the node above, the second color option is set by a color interface input.

Some nodes have special sockets that can accept multiple inputs. These sockets will have an ellipsis shape rather than a circle to indicate their special behavior.

Outputs

The outputs are located on the top right side of the node, and can be connected to the input of nodes further down the node tree.

Conversion

Some socket types can be converted to others either implicitly or explicitly. Implicit conversion happens automatically without the need of a conversion node. For example, Float sockets and Color sockets can be linked to each other.

Once a socket conversion is made, data may be lost and cannot be retrieved later down the node tree. Implicit socket conversion can sometimes change the data units as well. When plugging a *Value* input node into an angle socket, it'll default to use radians regardless of the scene's Units. This happens because the Value node has no unit while the angle input does.

Valid conversions:

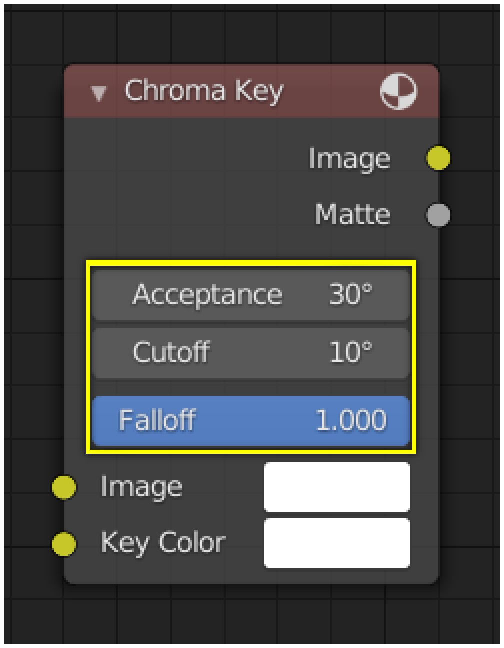
- Between color and vector – mapping between color channels and vector components.

- Between color and float – the color data is converted to its grayscale equivalent.
- Color/float/vector to Shader – implicitly converts to color and gives the result of using an Emission node.
- Between float and integer – integers simply become floats, floats are truncated.
- Between float and vector – when a float becomes a vector the value is used for each component. When a vector becomes a float the average of the components is taken.
- Between float and boolean – values greater than 0 are true, true maps to 1, and false maps to 0.
- Between rotations and matrices.

Explicit conversion requires the use of a conversion node such as the Shader To RGB node or the RGB to BW Node node. The Math Node node also contains some functions to convert between degrees and radians.

Properties

Many nodes have settings which can affect the way they interact with inputs and outputs. Node settings are located below the outputs and above any inputs.



An example of the controls on the Chroma Key node.

Selecting

All `A`
: Selects all nodes.

None `Alt-A`
: Deselects all nodes.

Invert `Ctrl-I`
: Inverts the current selection.

Box Select `B`
: See Box Select.

Circle Select
: See Circle Select.

Lasso Select
: See Lasso Select.

Select Linked From `L`
: Expand the selection to nodes which are linked to the inputs of the currently selected nodes.

Select Linked To `Shift-L`
: Expand the selection to nodes which are linked to the outputs of the currently selected nodes.

Select Grouped `Shift-G`
: Selects nodes that have similar properties as the active node.

  Type
  : The node type, e.g. all Math nodes.

  Color

The node color. (Nodes can be given a custom color to visually organize them in the editor; this is not related to any color information they might consume or produce as part of their function. The color can be set in the Sidebar.)

Prefix, Suffix

Matches the name property from start/end of the text.

Activate Same Type Previous/Next `Shift-]`/`Shift-[`

Finds the previous/next node of same type, activates it, and ensures it’s visible.

Find Node `Ctrl-F`

Shows a search pop-up for finding a node by name.

Select Multiple `Shift-LMB`

Add/remove a node to/from the selection.

Arranging Nodes

Snapping

The snapping options can be found on the rightmost side of the node editor's header.

Snap `Shift-Tab`

Toggle snapping on or off. You can also do this temporarily by holding `Ctrl` after starting to drag one or more nodes around.

Snap Node Element `Shift-Ctrl-Tab`

What to snap the selected nodes to:

Grid::	Snap to the grid in the background.
Node X::	Snap to the X coordinate of another node's vertical border.
Node Y::	Snap to the Y coordinate of another node's horizontal border.
Node X/Y::	Combination of the above.

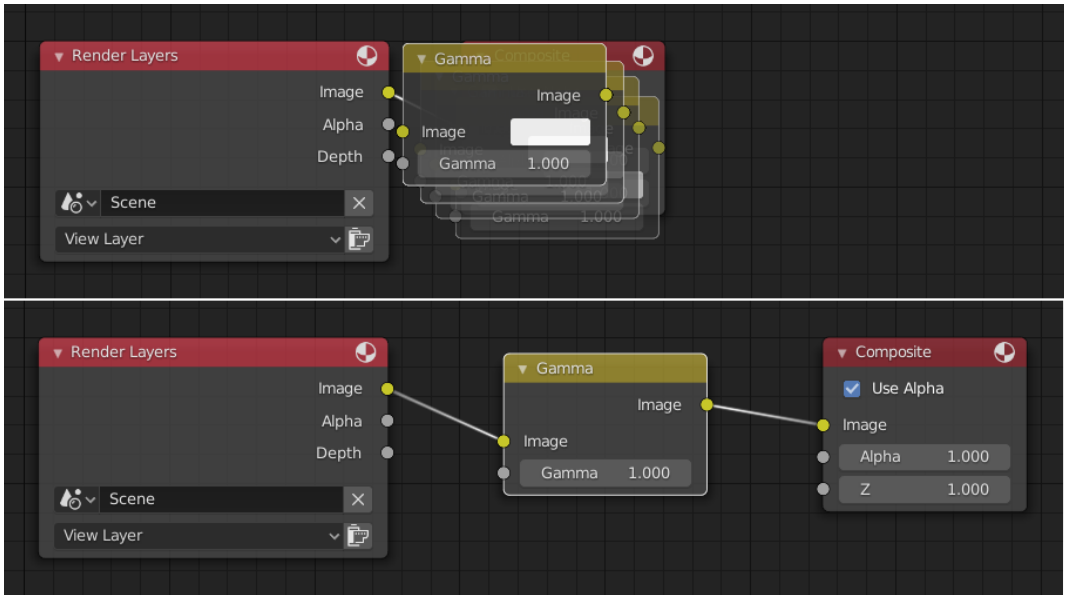
Snap Target

Which part of the selected nodes to snap:

Closest::	Snap closest point onto target.
Center::	Snap center of selected nodes onto target.
Median::	Snap median of selected nodes onto target.
Active::	Snap active node onto target.

Auto-Offset

When you drop a node with at least one input and one output socket onto an existing connection between two nodes, *Auto-offset* will, depending on the direction setting, automatically move the left or right node away to make room for the new node. *Auto-offset* is a feature that helps organizing node layouts interactively without interrupting the user workflow.


Render Layers
Image
Alpha
Depth
Scene
View Layer
Gamma
Composite
Image
Image
Gamma 1.000
Render Layers
Image
Alpha
Depth
Scene
View Layer
Gamma
Image
Image
Gamma 1.000
Composite
Use Alpha
Image
Alpha 1.000
Z 1.000

Auto-offset is enabled by default, but it can be disabled in the Preferences.

You can toggle the offset direction while you are moving the node by pressing `T`.

The offset margin can be changed using the *Auto-offset Margin* setting in the Editing section of the Preferences.

See also

Example Video:

Auto-Offset. A workflow enhancement for Blender's node editors.

Editing

Transform

Reference

Menu:: *Node ▸ Move, Rotate, Resize*
Shortcut:: `G`, `R`, `S`

You can move the selected node(s) by simply clicking and dragging any empty part on them. Alternatively, you can press `G`, move the mouse, and click `LMB` to confirm.

Dragging a node on top of an existing link will intelligently insert the selected node into the link path. This generally works by using the first socket that matches the link type. The automatic node attachment feature can be toggled with `Alt`. When a node is automatically attached the surrounding nodes will be shifted to the right or left depending on the `T` toggle; see Auto-Offset for more information on this feature.

In general it is recommended to arrange your nodes within the view such that the data flows from left to right, top to bottom.

The width of a node can be changed by dragging its left or right border.

Rotating (`R`) and scaling (`S`) only apply when you have multiple nodes selected and only affect the nodes' positions.

Connecting Sockets

`LMB`-click on a socket and drag. YConnect to Outputou will see a line coming out of it: this is called a *link*. Keep dragging and connect the link to an input socket of another node, then release the `LMB`.

While multiple links can route out of an output socket, typically a single link can be attached to an input socket, that is unless the input is a multi-socket input with looks like a pill shaped socket.

To swap multiple links of a similar type, press and hold `Alt` while moving a link. This feature also works when adding a new link into a pre-existing socket.

To reposition the outgoing links of a node, rather than adding a new one, hold `Ctrl` while dragging from an output socket. This works for single as well as for multiple outgoing links.

Nodes that have no connections can be inserted on a link by just move the node over the link and release when the link is highlighted.

Make Links `F`
  Select multiple nodes with open sockets, then use the Make Links to create links between them. Use Make Links again if there are other nodes which can be connected.

Make and Replace Links `Shift-F`
  Make and Replace Links works similarly to *Make Links*, but it will replace existing links if any exist.

Disconnecting Sockets

Interactively

Drag the link away from its input socket and let it go, keeping it unconnected.

Mute Links

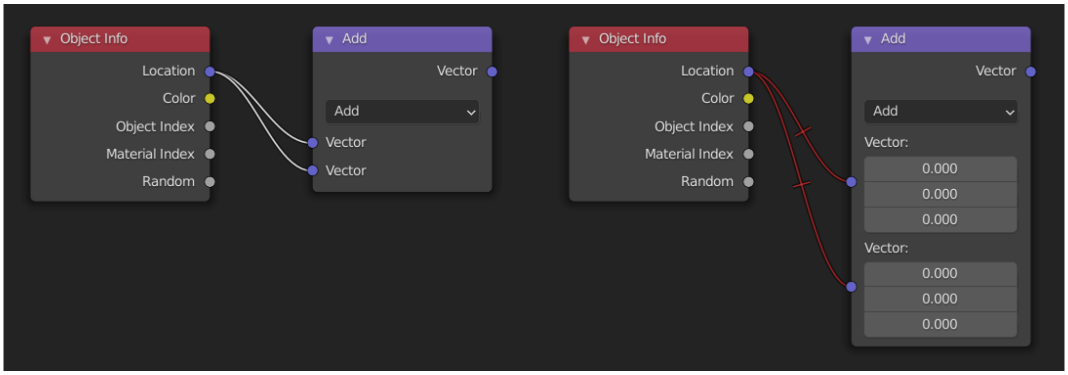
Reference

Menu:: *Node ‣ Mute Links*
Shortcut::

`Ctrl-Alt-RMB`

Activate the menu item or hold the key combination, then draw a line across one or more links to mute/unmute them. A muted link acts as though it’s no longer there; this also means the input fields for specifying fixed values become visible again.

When muting links on the input side of a reroute node, the links on its output side will be muted too.


Object Info
Location
Color
Object Index
Material Index
Random
Add
Vector
Add
Vector
Vector
Object Info
Location
Color
Object Index
Material Index
Random
Add
Vector
Add
Vector:
0.000
0.000
0.000
Vector:
0.000
0.000
0.000

Cut Links

Reference

Menu:: *Node ‣ Cut Links*
Shortcut:: `Ctrl-RMB`

Activate the menu item or hold the key combination, then draw a line across one or more links to delete them.

Note

The key combination is normally reserved for Lasso Select. In node editors, lasso selection is instead performed with `Ctrl-Alt-LMB`.

Detach Links `Alt-LMB` drag

Use Detach Links to cut all the links attached to the selected nodes and move the nodes to a new location.

Copy/Paste

Reference

Menu:: *Node* ‣ *Copy*, *Node* ‣ *Paste*
Shortcut:: `Ctrl-C`, `Ctrl-V`

Not only the selected nodes but also the connections between them are copied to the clipboard.

Note

The pasted node will be placed in the *same* position as when it was copied. Use the same cautions as when duplicating.

Duplicate

Reference

Menu:: *Node* ‣ *Duplicate*
Shortcut:: `Shift-D`

Select one or more nodes, activate the menu item or press the key combination, then move the mouse to a new location and click `LMB` (or press `Return`) to place the duplicated node(s).

Note

When you duplicate a node, the new node will be positioned *exactly* on top of the node that was duplicated. If you leave it there (and it is quite easy to do so), you can **not** easily tell that there are *two* nodes there!

When in doubt, select a node and move it slightly to see if something is hidden underneath.

Duplicate Linked

Reference

Menu:: *Node ‣ Duplicate Linked*
Shortcut:: `Alt-D`

Duplicate selected nodes, but not their node trees (in the case of group nodes), and move them.

Delete

Delete `X`, `Delete`
Deletes the selected node(s).

Delete with Reconnect `Ctrl-X`
Deletes the selected node(s), then creates new links connecting their former input nodes to their former output nodes.

Mute

Reference

Menu:: *Node ‣ Toggle Node Mute*
Shortcut:: `M`

Muting a node removes its contribution to the node tree, and makes all links pass through it without change. Links will appear red as an indicator of passing through the muted node.

Tip

Individual node links can be muted with Mute Links.

Show/Hide

Hide `H`
: Collapses the node so only the node header is visible. This can also be toggled by clicking the triangle on the left of the node header.

Toggle Node Preview `Shift-H`
: Shows/Hides a preview region on the node that displays the frame after that node's operation has been applied. This can also be toggled by clicking the material ball icon in the node header.

> **Note**
>
> This operator are only available in the Compositor.

Toggle Hidden Node Sockets `Ctrl-H`
: Collapses/Expands any input or output sockets that have no other nodes connected to them.

Toggle Node Options
: Shows/Hides all node properties.

Collapse and Hide Unused Sockets
: Applies both the *Toggle Hidden Node Sockets* and *Hide* operations.

Layers

Read Render Layers `Ctrl-R`
: Reads all the current scene's render layers from cache, as needed. This can be used to save RAM while rendering because the render layers do

not have to be saved in RAM. And also for recovering some information from a failed render. For this to work, Cache Result must be enabled.

Note

This operator are only available in the Compositor.

Connect to Output

Reference

Shortcut:: `Shift-Alt-LMB`

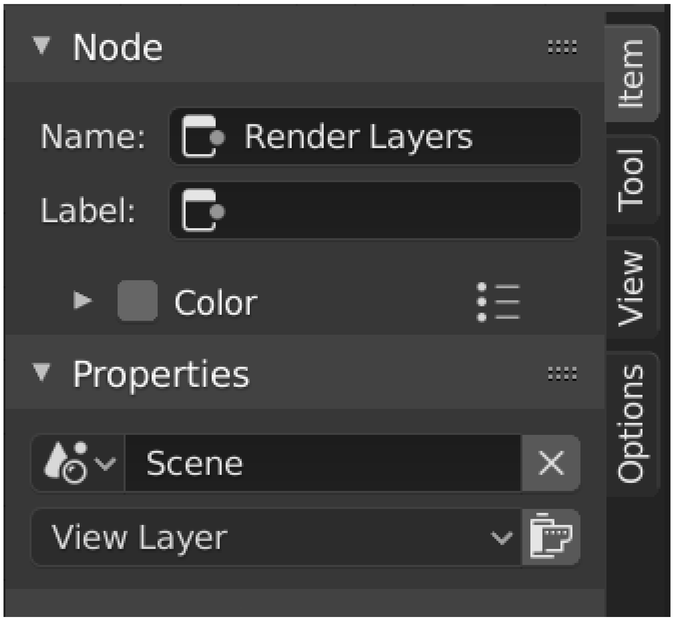
Connect the output of the selected node to the final output of the node tree (Composite in Compositor, Material Output or World Output in Shader, the final Group Output in Geometry Nodes, Output in Texture Nodes), or, if the node is inside a group, to the Group Output.

Sidebar

Node

Reference

Panel:: *Sidebar ‣ Node*



Node
Item
Tool
View
Options
Color
Properties

Name: Render Layers

Label:

Scene

View Layer

Node tab with a compositing Render Layers node selected.

Node

Name
: A unique node identifier inside this node tree.

Label
: Nodes can be given a title by modifying the text field.

Warning Propagation

Controls which warnings in this node will be propagated to the parent node group or modifier. This only exists for Geometry Nodes.

Color

By default, the node’s background color is defined by the user theme. This color can be overridden by selecting a custom color in this panel. Custom node colors can be used to provide a visual cue to help distinguish some nodes from others. The button to the right of the checkbox lets you save colors as presets for reusing later on (much like a palette).

Color

Color of the node background.

Node Color Specials

This menu contains Operators for working with nodes with custom colors.

Copy Color

Copies the color of the Active node and applies it to all selected nodes.

Properties

The properties that are shown depend on the type of node selected, e.g. a Mix node has different properties than a Mask node.

Tool

Reference	
Panel::	*Sidebar region ‣ Tool*

Active Tool

The info in this panel changes with the selected tool.

View

Reference

Panel:: *Sidebar region ‣ View*

Annotations

You can select the Annotate tool in the Toolbar to make annotations in the node editor. See Annotate Tool for more info.

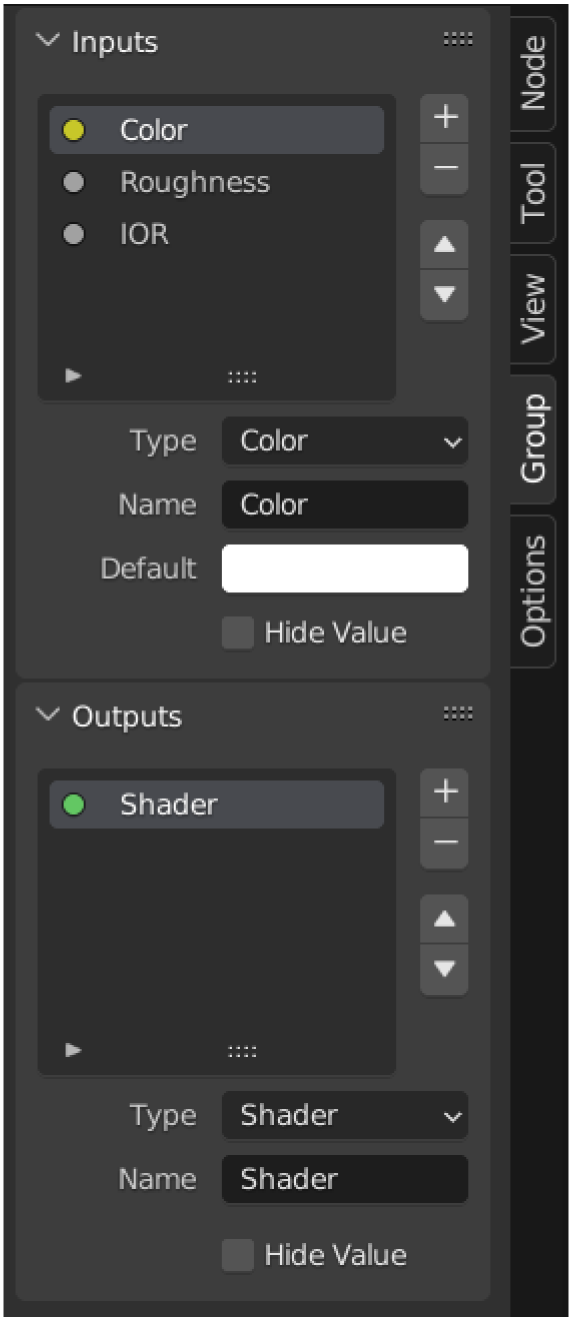
Node Groups

Grouping nodes can simplify a node tree by hiding away complexity and reusing repetitive parts.

Conceptually, node groups allow you to treat a *set* of nodes as though it were just one node. They're similar to functions in programming: they can be reused (even in different node trees) and can be customized by changing their "parameters."

As an example, say you created a "Wood" material that you would like to have in different colors. One way of doing this would be to duplicate the entire material for every color, but if you did that, you'd have to go over all those copies again if you later wanted to change the density of the grain lines. Instead, it would be better to move the nodes that define the wood look into a node group. Each material can then reuse this node group and just supply it with a color. If you then later want to change the grain line density, you only have to do it once inside the node group, rather than for every material.

Node groups can be nested (that is, node groups can contain other node groups).



Inputs

- ● Color
- ● Roughness
- ● IOR

Type: Color

Name: Color

Default:

☐ Hide Value

Outputs

- ● Shader

Type: Shader

Name: Shader

☐ Hide Value

Example of a node group.

Note

Recursive node groups are prohibited for all the current node systems to prevent infinite recursion. A node group can never contain itself (or another group that contains it).

Tip

Like all data-blocks, node groups with names that start with `.` are normally hidden from lists and menus and can only be accessed through search. This can be useful for node asset authors to hide their internal sub-groups from the final user.

When a node group is created, new *Group Input* and *Group Output* nodes are generated to represent the data flow into and out of the group. Furthermore connections to input sockets coming from unselected nodes will become attached to new sockets on the *Group Input* node. Similarly, outgoing connections to input sockets of unselected nodes will become attached to the new *Group Output* node.

If you want to pass an additional parameter into the group, a socket must be added to the *Group Input* node. To do this, drag a connection from the hollow socket on the right side of the *Group Input* node to the desired input socket on the node requiring an input. The process is similar for the *Group Output* regarding data you want to be made available outside the group.

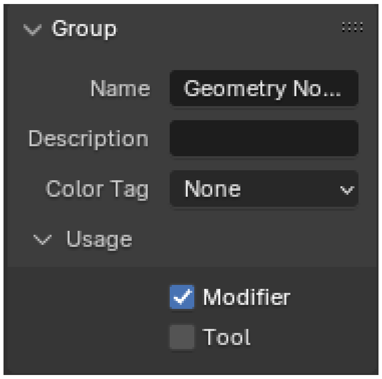
Properties

Group

Reference

Panel::	*Sidebar* ▸ *Group* ▸ *Group*

This panel contains properties that relate the group node such as it’s name and look.



Name: Geometry No...

Color Tag: None

☑ Modifier

☐ Tool

The *Group* panel.

Name

The name of node as displayed in the Title.

Description

The message displayed when hovering over the Title or in add menus.

Color Tag

Color tag of the node group which influences the header color.

Node Width

The width for newly created group nodes.

(Set Default Node Width)

Set the width based on the parent group node in the current context

Usage ***Geometry Nodes***

This panel is only visible in the Geometry Node Editor.

Modifier

The node group is used as a Geometry Nodes Modifier.

Tool

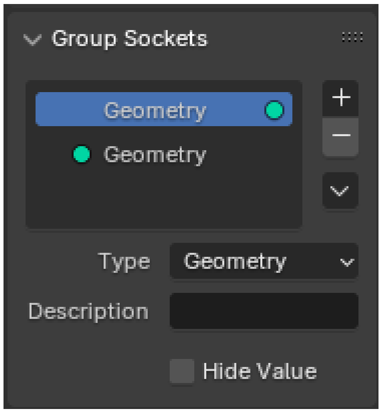
The node group is used as a Node-Based Tools.

Group Sockets

Reference

Panel:: *Sidebar* ‣ *Group* ‣ *Group Sockets*

This panel is used to add, remove, reorder, and edit the sockets of the group's input and output.



The *Group Sockets* panel.

Socket List

A List View of all inputs, outputs and panels.

Here you can name the socket which is displayed in the node's interface.

Description

The message displayed when hovering over socket properties.

Closed by Default *Panels*

Panel is closed by default on new nodes.

Default

The value to use when nothing is connected to the socket.

Min, Max

The minimum and maximum value for the UI button shown in the node interface. Note, this is not a minimum or maximum for the data that can pass through the node. If a socket passes a higher value than the maximum, it will still pass into the node unchanged.

Geometry Nodes

Default Input

Input to use when the socket is unconnected. Requires *Hide Value* to be enabled.

Hide Value

Hide the socket value even when the socket is not connected.

Hide in Modifier

Don't show the input value in the geometry nodes modifier interface. This allows the input to be used in the context of a node group but not as a modifier input.

This option is only available for geometry nodes and only for input sockets.

Single Value
Only allow single value inputs rather than Fields.

Make Group

Reference

Menu::	*Node* ▸ *Make Group*
Shortcut::	`Ctrl-G`

To create a node group, select the nodes you want to include, then press `Ctrl-G` or click *Group* ▸ *Make Group*. A node group will have a green title bar. All selected nodes will now be contained within the node group. Default naming for the node group is “NodeGroup”, “NodeGroup.001” etc. There is a name field in the node group you can click into to change the name of the group. Change the name of the node group to something meaningful.

When appending node groups from one blend-file to another, Blender does not make a distinction between material node groups or composite node groups. So it is recommended to use some naming convention that will allow you to distinguish between the two types.

Tip

The “Add” menu of each node editor contains an “Output” category with node types such as “Material Output.” These node types should not be confused with the “Group Output” node found in node groups, and should not be used in node groups either (only in the top-level node tree).

Insert Into Group

Reference

Menu:: *Node ‣ Insert Into Group*

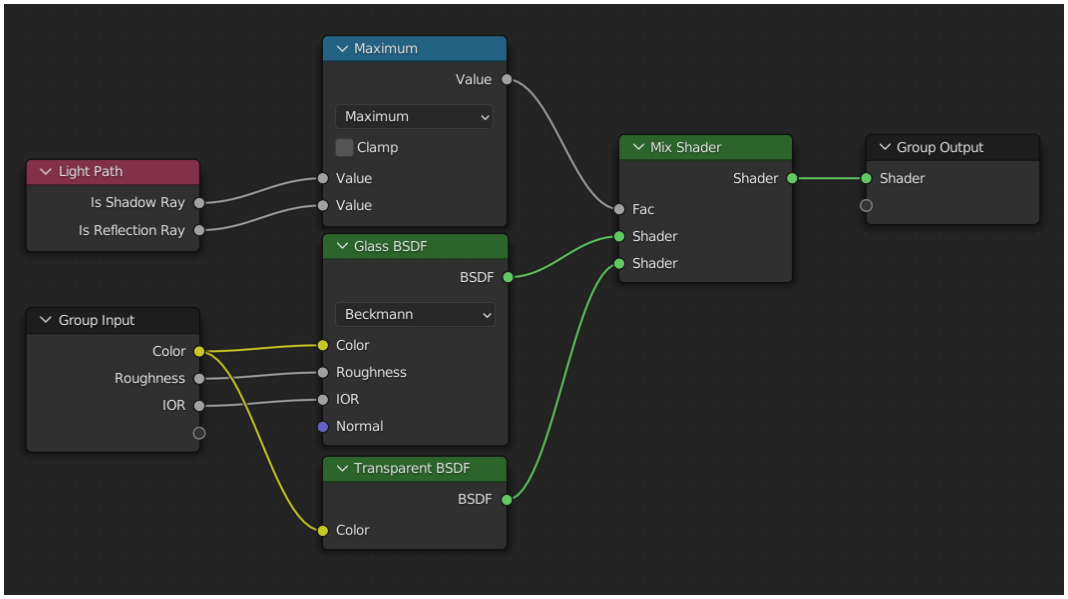
Moves the selected nodes into the active group node. To use, select a set of nodes, ending with the destination group node, then, running the operation will move those nodes into that group. The moved nodes are collected into a group of their own to preserve their connection context, having their own group input and output nodes. The group's existing input and output nodes are updated with new sockets, if any, from the new nodes. The node group must be edited to contain a single *Group Input* and a single *Group Output* node.

Edit Group

Reference

Menu:: *Node ‣ Edit Group*
Header:: *Go to Parent Node Tree*
Shortcut:: `Tab`, `Ctrl-Tab`

With a node group selected, press `Tab` to move into it and see its content. Press `Tab` again (or `Ctrl-Tab`) to leave the group and go back to its parent, which could be the top-level node tree or another node group. You can refer to the breadcrumbs in the top left corner of the node editor to see where you are in the hierarchy.


Light Path
Is Shadow Ray
Is Reflection Ray
Group Input
Color
Roughness
IOR
Maximum
Value
Maximum
Clamp
Value
Value
Glass BSDF
BSDF
Beckmann
Color
Roughness
IOR
Normal
Transparent BSDF
BSDF
Color
Mix Shader
Shader
Fac
Shader
Shader
Group Output
Shader

Example of an expanded node group.

Ungroup

Reference

Menu:: *Node ‣ Ungroup*
Shortcut:: `Ctrl-Alt-G`

Removes the group and places the individual nodes into your editor workspace. No internal connections are lost, and now you can link internal nodes to other nodes in your workspace.

Separate `P`
Separate selected nodes from the node group.

Copy
Copy to parent node tree, keep group intact.

Move
Move to parent node tree, remove from group.

Reusing Node Groups

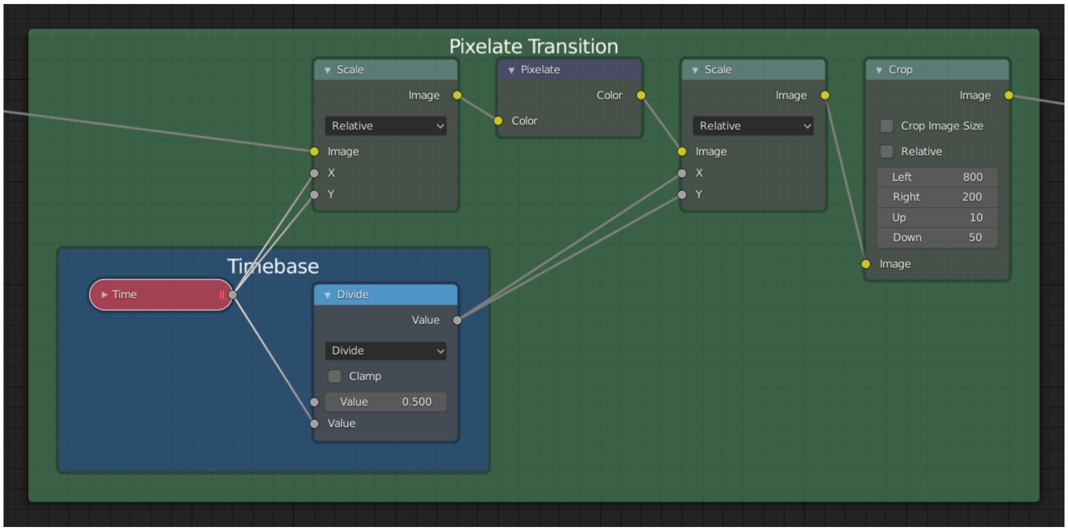
Reference

Menu:: *Add ‣ Group*
Shortcut:: `Shift-A`

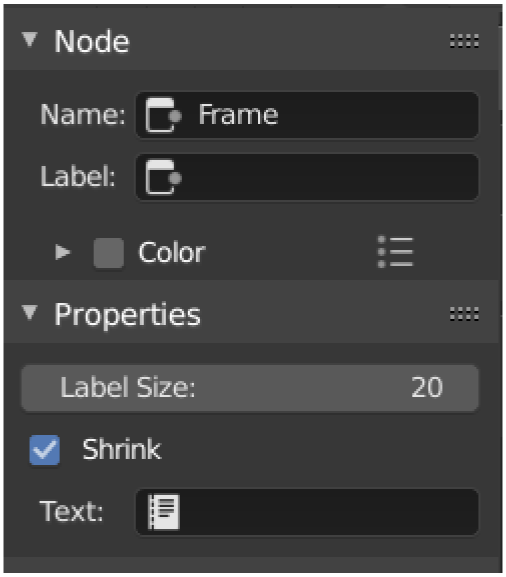
Existing node groups can be placed again after they're initially defined, be it in the same node tree or a different one. It's also possible to import node groups from a different blend-file using *File ‣ Link/Append*.

Frame Node

The Frame node is useful for organizing nodes by collecting related nodes together in a common area. Frames are useful when a node setup becomes large and confusing yet the re-usability of a Node Group is not required.


Pixelate Transition
Scale
Image
Relative
Image
X
Y
Pixelate
Color
Color
Scale
Image
Relative
Image
X
Y
Crop
Image
Crop Image Size
Relative
Left 800
Right 200
Up 10
Down 50
Image
Timebase
Time
Divide
Value
Divide
Clamp
Value 0.500
Value

Properties


Node
Color
Properties

Name: Frame

Label:

Label Size: 20

☑ Shrink

Text:

Label Size

Font size of the label. For example, for subordinate frames to have smaller titles.

Shrink

Once a node is placed in the Frame, the Frame shrinks around it so as to remove wasted space. At this point it is no longer possible to select the edge of the Frame to resize it, instead resizing occurs automatically when nodes within the Frame are rearranged. This behavior can be changed by disabling this option.

Text

When you need to display more comprehensive text, frame nodes can display the contents of a text data-block. This is read-only, so you will need to use the *Text Editor* to modify the contents.

Editing

Join in New Frame

Reference

Menu::	*Node ‣ Join in new Frame*
Shortcut::	`Ctrl-J`

Make a new frame including the selected nodes.

Add to Frame

Reference

Shortcut::	`Ctrl-P`

Once a frame node is placed, nodes can be added by dropping them onto the frame or by selecting the node(s) then the frame and using `Ctrl-P`. This can be thought of as Parenting the selection to the frame.

Remove from Frame

Reference

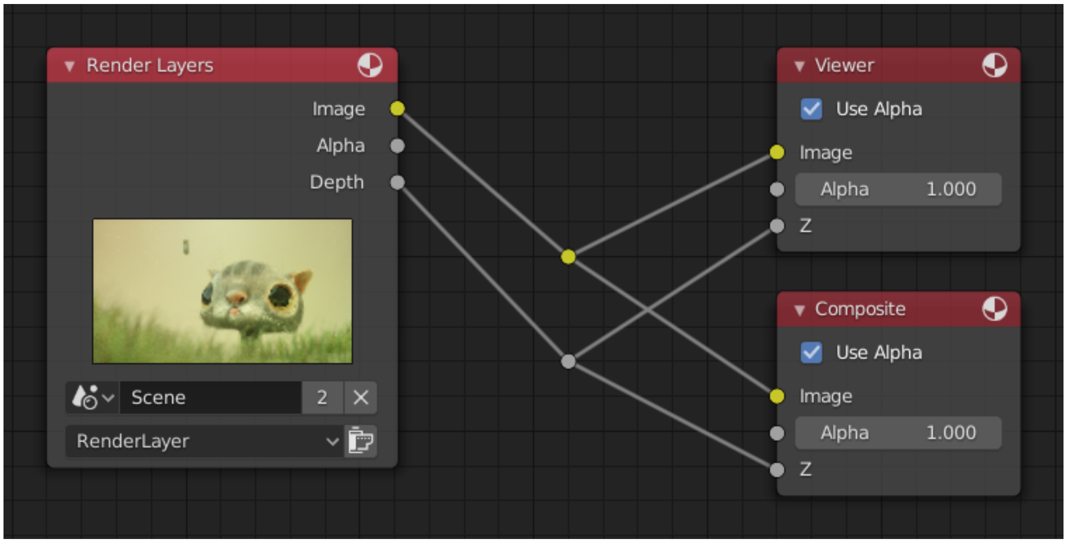
Menu::	*Node ‣ Remove from Frame*
Shortcut::	`Alt-P`

To remove nodes from a frame, select and use `Alt-P`. This can be thought of as unparenting the selection from the frame.

Reroute Node

A node used primarily for organization. Reroute looks and behaves much like a socket on other nodes in that it supports one input connection while allowing multiple output connections.

To quickly add a Reroute node into an existing connection, hold `Shift` and `RMB` while sweeping across the link to add a *Reroute node*.


Render Layers
Image
Alpha
Depth
Viewer
Image
Z
Composite
Image
Z

Scene 2

RenderLayer

☑ Use Alpha

Alpha 1.000

☑ Use Alpha

Alpha 1.000

Properties

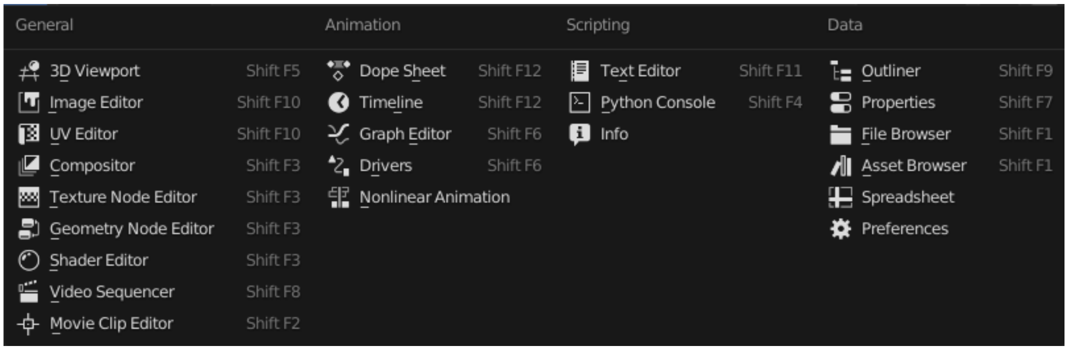
Input
: Input value used for unconnected sockets.

Editors

Blender provides a number of different editors for displaying and modifying different aspects of data. An Editor is contained inside an Area which determines its size and placement within the Blender window. Every area may contain any type of editor.

The *Editor Type* selector, the first button at the left side of a header, allows you to change the Editor in that area. It is also possible to open the same Editor type in different areas at the same time.

See User Interface for documentation on the general interface.


General
3D Viewport Shift F5
Image Editor Shift F10
UV Editor Shift F10
Compositor Shift F3
Texture Node Editor Shift F3
Geometry Node Editor Shift F3
Shader Editor Shift F3
Video Sequencer Shift F8
Movie Clip Editor Shift F2
Animation
Dope Sheet Shift F12
Timeline Shift F12
Graph Editor Shift F6
Drivers Shift F6
Nonlinear Animation
Scripting
Text Editor Shift F11
Python Console Shift F4
Info
Data
Outliner Shift F9
Properties Shift F7
File Browser Shift F1
Asset Browser Shift F1
Spreadsheet
Preferences

The Editor Type selector.

General

- 3D Viewport
- Image Editor
- UV Editor
- Compositor
- Texture Nodes
- Geometry Node Editor
- Shader Editor
- Video Sequencer
- Movie Clip Editor

Animation

- Dope Sheet
- Timeline
- Graph Editor
- Drivers Editor
- Nonlinear Animation

Scripting

- Text Editor
- Python Console
- Info Editor

Data

- Outliner
- Properties
- File Browser
- Asset Browser
- Spreadsheet
- Preferences

3D Viewport

- Introduction
    - Header Region
    - Toolbar Region
    - Sidebar Region
    - Asset Shelf Region
- Startup Scene
    - Elements
- Object Modes
    - Object Mode List
    - Switching Objects
    - Multi-Object Editing
- Navigating
    - Introduction
    - Navigation
    - Fly/Walk Navigation
    - Aligning
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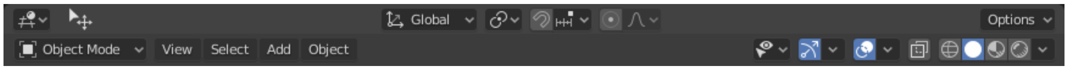
    - Local View
    - Camera View
    - Viewpoint
    - View Regions
    - Contextual Views
- 3D Cursor
    - Placement
- Selecting
    - Object Mode
    - Edit Mode
    - Pose Mode
    - Particle Edit Mode
- Controls
    - Transform Orientation
    - Pivot Point
    - Snapping

  - Proportional Editing
- Display
  - Object Type Visibility
  - Viewport Gizmos
  - Viewport Overlays
  - Viewport Shading
- Toolbar
  - Object Mode
  - Edit Mode
  - Paint Modes
  - Grease Pencil
- Sidebar
  - Item
  - Tool
  - View
- Viewport Render
  - Settings
  - Rendering

Introduction

The 3D Viewport is used to interact with the 3D scene for a variety of purposes, such as modeling, animating, texture painting, etc.

Header Region



Object Mode header.

The header contains various menus and controls based on the current mode. Its items are split into three groups:

Mode & Menus

Mode `Ctrl-Tab`

The 3D Viewport has several modes used for editing different kinds of data. For example, the default Object Mode would let you place a character in the scene, while Pose Mode would allow you to pose it.

The shortcut `Ctrl-Tab` brings up a pie menu for quick mode switching. If you have an Armature selected, it'll instead switch between Object Mode and Pose Mode.

Pressing `Tab` will switch between Object Mode and Edit Mode for objects that support it.

View

This menu offers tools for navigating in 3D space.

The other menus depend on the current mode, Object Mode menus listed below:

Select
: Contains tools for selecting objects.

Add `Shift-A`
: Contains a list of different objects types that can be added to the scene.

Object
: Contains tools for operating on objects, such as duplicating them. A subset of these tools can also be accessed by rightclicking in the 3D Viewport.

Transform Controls

Transform Orientation `Comma`
: Used to change the Transform Orientation, which affects the rotation of the transform gizmo.

Pivot Point `Period`
: Used to change the Pivot Point, which affects the location of the transform gizmo.

Snapping `Shift-Tab`
: Offers options for snapping items to others that are nearby. You can hold `Ctrl` to toggle snapping on/off temporarily (as long as the key is held).

Proportional Editing `O`
: Used to smoothly transform unselected items that are near the selected ones. See Proportional Editing.

Display & Shading

Object Type Visibility
: Change which types of objects are visible/selectable in the 3D Viewport. See Object Type Visibility.

Viewport Gizmos
: Change how gizmos are displayed in the 3D Viewport.

Viewport Overlays

Change how overlays are displayed in the 3D Viewport.

X-Ray `Alt-Z`

Make the whole scene transparent, allowing you to see and select items that would otherwise be occluded. This is a shortcut to the X-Ray option inside the Viewport Shading popover.

In Pose Mode, this same button controls a different setting with its own separate on/off state. Rather than making the scene transparent, it shows the armature in front of any geometry.

Viewport Shading

Change the shading of the 3D Viewport.

Toolbar Region

The Toolbar contains tools depending on the current mode (for example, modeling tools in *Edit Mode*, brush tools in *Sculpt Mode*…).

See Tools for more information.

Sidebar Region

The Sidebar region contains properties of the active object and tool, as well as of the viewport itself.

See Sidebar for more information.

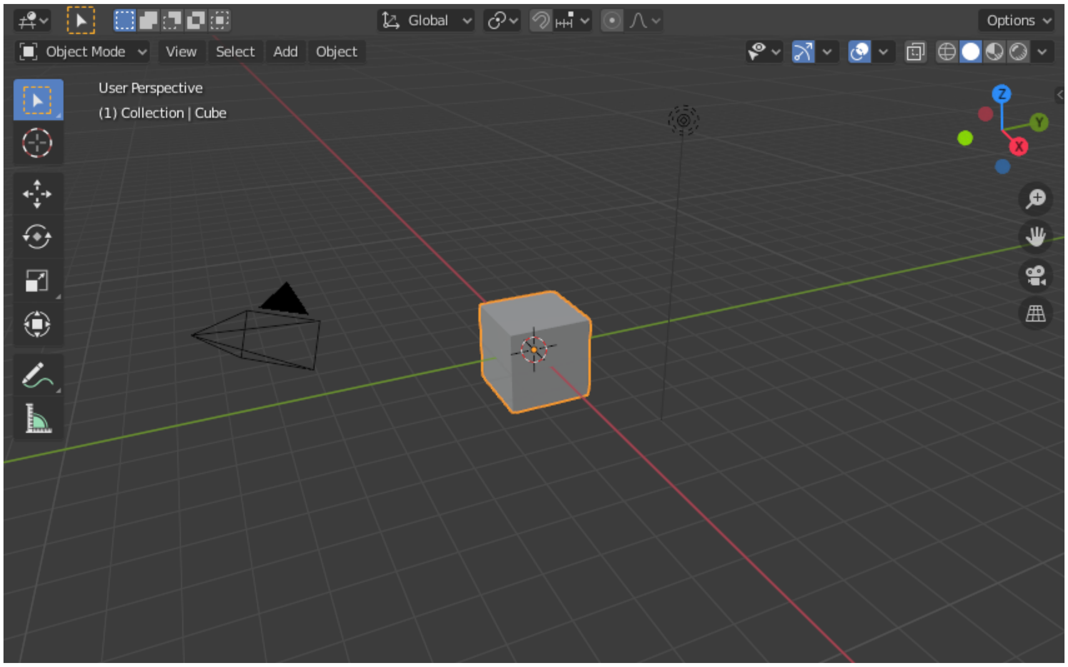
Asset Shelf Region

Depending on the current mode, the asset shelf may be available, providing quick access to assets for this specific mode (for example pose assets in *Pose Mode*, brush assets in *Sculpt Mode*).

See Asset Shelf for more information.

Startup Scene

After closing the splash screen, the startup scene is displayed in the 3D Viewport (if no other blend-file was loaded). This startup scene can be customized.


Global
Options
Object Mode
View
Select
Add
Object
User Perspective
(1) Collection | Cube
Z
Y
X

The startup scene.

Elements

Cube
: The gray cube in the center of the scene is a mesh object. Its orange outline indicates that it’s selected. The orange dot in the center is its Origin, which indicates its precise location.

Light
: The set of concentric black circles is a light source illuminating the cube.

Camera

The pyramid with a big triangle above it is the camera, which is used as the point of view for rendering.

3D Cursor

The 3D cursor, a cross with a red-and-white circle, determines where newly added objects are placed and can also serve as a transformation pivot point.

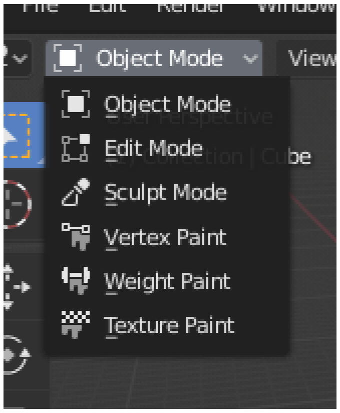
Grid Floor

The gray lines forming a floor mark the zero height of the world. The red and green lines are the axes of the world coordinate system. They meet at the world origin, which is also where the origin of the *Cube* is located. The Grid Floor settings are in the Viewport Overlays popover.

Text Info

The top left corner of the viewport shows various bits of information – see Viewport Overlays for details.

Object Modes



The Mode select menu.

Modes allow editing different aspects of objects. While Object Mode allows you to position/rotate/scale them, Edit Mode allows changing their geometry, Pose Mode allows posing them, and so on.

You can change the current mode using the *Mode* selector in the 3D Viewport header. Which modes are available depends on the object's type. The complete list is shown below.

Apart from using the selector, you can also press `Ctrl-Tab` to bring up a pie menu around the cursor for faster access. (If the selected object is an Armature, this shortcut will instead switch between Object Mode and Pose Mode.)

Pressing `Tab` will toggle Edit Mode for objects that support it.

Modes can affect many things in Blender:

- Each mode changes the header and Toolbar to show its own unique set of menus and tools. This also means it affects the available keyboard shortcuts.
- Modes can completely change the look of the viewport. For example, Weight Paint mode will shade the object to show its vertex weights, which are not normally visible.
- Modes can affect other editors. For example, the UV Editor can only be used if the 3D Viewport is in Edit Mode. In the Properties editor, too, certain buttons and panels can only be used in certain modes.

Object Mode List

Blender’s Modes

Icon	Name	Details
	Object Mode	The default mode, available for all object types. Allows editing position, rotation and scale, duplicating objects, and so on.
	Edit Mode	A mode for editing an object’s shape (vertices/edges/faces for meshes, control points for curves/surfaces, points/strokes for Grease Pencil, etc.).
	Sculpt Mode	Provides an alternative toolset for editing an object’s shape (only for meshes).
	Vertex Paint Mode	A mesh-only mode that allows you to set your mesh’s vertex colors (i.e. to “paint” them).
	Weight Paint Mode	A mesh-only mode, dedicated to vertex group weighting.
	Texture Paint Mode	A mesh-only mode that allows you to paint a texture directly on the model, in the 3D Viewport.
	Particle Edit Mode	A mesh-only mode dedicated to particle systems, useful for editable systems (hair).

Icon	Name	Details
	Pose Mode	An armature-only mode, dedicated to posing.
	Draw Mode	A Grease Pencil-only mode, dedicated to creating Grease Pencil strokes.
	Sculpt Mode (Grease Pencil)	A Grease Pencil-only mode, used to deform and shape existing strokes more organically.
	Edit Mode (Grease Pencil)	A Grease Pencil-only mode, dedicated to modifying individual strokes and points of Grease Pencil objects.
	Vertex Paint Mode (Grease Pencil)	A Grease Pencil-only mode, dedicated to adding color the vertices of strokes directly.
	Weight Paint Mode (Grease Pencil)	A Grease Pencil-only mode, dedicated to assigning vertex weights to stroke.

Note

The cursor becomes a brush in Paint and Sculpt Modes.

We will not go into any more detail on mode usages here, because they are dealt with in their own sections.

Hint

If you are reading this manual and some button or menu option is referenced that does not appear on your screen, it may be that you are not in the proper mode for that option to be valid.

Switching Objects

Reference

Mode::	All Modes
Shortcut::	`Alt-Q`

If you enter a mode such as Weight Paint for an object and then select another object, Blender will typically switch back to Object Mode. This means that, if you want to weight paint the other object too, you have to enter the mode a second time.

There is a way of avoiding this, however. Once you enter a mode, the Outliner will show a dot next to other objects that also support it. By clicking such a dot, you can switch over to another object without leaving the mode.

Alternatively, you can hover over the other object in the 3D Viewport and press `Alt-Q`.

See also

Lock Object Modes for preventing *accidental* mode changes.

Multi-Object Editing

Edit Mode and Pose Mode let you work with multiple objects even more easily than described above, as they can have multiple objects in the mode at the same time.

There are two ways of accomplishing this:

- If you're not yet in the mode, you can simply select all the objects and enter it.
- If you're already in the mode, you can bring other objects into it by clicking `Ctrl-LMB` on the dot in the Outliner. Removing objects from the mode works in the same way.

Some points of note:

- The Properties editor will only ever show the details (shape keys, UV maps…) of the active object, not of all the selected ones.
- Selecting any element from an object will make it the active one.
- There are limits to the edits you can make. For example, you can't create an edge that connects vertices from different objects.

Navigating

- Introduction
  - Navigation Gizmo
- Navigation
  - Orbit
  - Roll
  - Pan
  - Zoom In/Out
  - Zoom Region
  - Dolly View
  - Frame All
  - Frame Selected
- Fly/Walk Navigation
  - Walk Navigation
  - Fly Navigation
- Aligning
- Perspective/Orthographic
  - Options
- Local View
  - Toggle Local View
- Camera View
  - Viewing the Active Camera
  - Setting the Active Camera
  - Frame Camera Bounds
  - Zoom Camera 1:1
  - Camera Positioning
- Viewpoint
- View Regions
  - Clipping Region
  - Render Region
- Contextual Views
  - Quad View

Introduction

To be able to work in the three-dimensional space that Blender uses, you must be able to change your viewpoint as well as the viewing direction of the scene. While we will describe the *3D Viewport* editor, most of the other editors have similar functions. For example, it is possible to pan and zoom in the Image editor.

Tip

Some navigation tools require a middle mouse button or numpad. If you don't have one of these, see the Keyboard and Mouse page of the manual to learn how to work around this.

Navigation Gizmo

The navigation gizmo can be found in the top right of the editor.

Navigation Gizmo (left) and Navigation Gizmo in camera view (right).

Navigation

Orbit

Reference

Mode::	All modes
Menu::	*View* ‣ *Navigation* ‣ *Orbit*
Shortcut::	`MMB`, `Numpad2`, `Numpad4`, `Numpad6`, `Numpad8`.

Rotate the view around the point of interest by clicking and dragging `MMB` on the viewport's area.

`RMB` cancels the orbit operation.

The `Alt` key has several effects on orbiting:

- Clicking a point with `Alt-MMB` will make it the point of interest: it becomes the central point which the view orbits around.
- Holding `Alt` and then dragging with `MMB` in a certain direction will align the view to an axis and make it orthographic.
- Dragging with `MMB` and then holding `Alt` will perform an orbit while also snapping to the world axes, as well as the diagonals between them.

To change the viewing angle in discrete steps, use `Numpad8` and `Numpad2` to go up and down, or `Numpad4` and `Numpad6` for left and right. You can also press `Numpad9` to switch to the opposite side of the view (rotates the camera 180° around the Z axis).

See also

- Orbit Style Preference

- Auto-Perspective Preference

Roll

Reference

Mode:: All modes
Menu:: *View* ▸ *Navigation* ▸ *Roll*
Shortcut:: `Shift-Numpad4`, `Shift-Numpad6`

Rotate the viewport camera around its viewing direction in 15° discrete steps by default. See the rotation angle preference to configure.

To reset the roll, you can first align the view to the global X axis using `Numpad3`, then orbit to get back to the regular perspective view.

`RMB` cancels the roll operation.

Pan

Reference

Mode:: All modes
Menu:: *View* ▸ *Navigation* ▸ *Pan*
Shortcut:: `Shift-MMB`, `Ctrl-Numpad2`, `Ctrl-Numpad4`, `Ctrl-Numpad6`, `Ctrl-Numpad8`

Moves the view up, down, left and right. To pan the view, hold down `Shift` and drag `MMB` in the 3D Viewport. For discrete steps, use the hotkeys `Ctrl-Numpad8`, `Ctrl-Numpad2`, `Ctrl-Numpad4` and `Ctrl-Numpad6` as with orbiting.

`RMB` cancels the orbit operation.

Zoom In/Out

Reference

Mode::	All modes
Menu::	*View ‣ Navigation ‣ Zoom In/Out*
Shortcut::	`Ctrl-MMB`, `Wheel`, `NumpadPlus`, `NumpadMinus`

Moves the view closer to, or further away from, the point of interest. You can zoom in and out by rolling the `Wheel` or dragging with `Ctrl-MMB`. To zoom with discrete steps, use the hotkeys `NumpadPlus` and `NumpadMinus`.

Hint

If you get lost in 3D space (which is not uncommon), Frame All and Frame Selected can be used to show the contents of your scene.

`RMB` cancels the zoom operation.

Zoom Region

Reference

Mode::	All modes
Menu::	*View ‣ Navigation ‣ Zoom Region…*
Shortcut::	`Shift-B`

The *Zoom Region* tool allows you to specify a rectangular region by dragging with `LMB`. The view will then zoom in on this region.

You can also drag with `MMB` to zoom out instead.

Dolly View

Reference

Mode:: All modes
Menu:: *View ▸ Navigation ▸ Dolly View…*
Shortcut:: `Shift-Ctrl-MMB`

In most cases it's sufficient to zoom the view to get a closer look at something. However, zooming only gets you up to the point of interest and no further. If you hit this point where zooming no longer works, you can instead Dolly by holding `Shift-Ctrl` and dragging up or down with `MMB`. This will move the point of interest (and the view along with it).

`RMB` cancels the dolly operation.

Hint

Dolly changes orthographic views to a perspective projection.

This is done because dolly doesn't work well with an orthographic projection because *moving* forwards/backwards with an orthographic projection doesn't have the effect of zooming.

Frame All

Reference

Mode:: All modes
Menu:: *View ▸ Frame All*
Shortcut:: `Home`

Changes the view so that you can see all objects.

Frame Selected

Reference

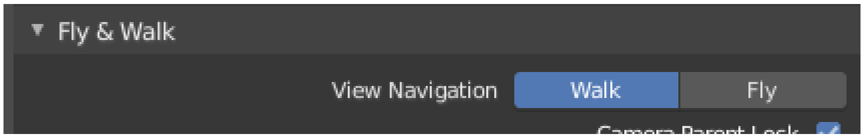
Mode:: All modes
Menu:: *View ▸ Frame Selected*
Shortcut:: `NumpadPeriod`

Changes the view so that you can see the selected object(s).

Fly/Walk Navigation

The standard navigation controls are sometimes limiting, especially for large environments such as architectural models. In these cases, it may be preferable to use first person controls instead, where you can look around while “standing” in one place rather than orbiting around a central viewpoint.

Blender offers two such alternative navigation methods: Flying and Walking. You can initiate either method from the *View* ‣ *Navigation* menu. You can also initiate your preferred one (configured in the Preferences) by pressing `Shift-AccentGrave`.



View Navigation.

Common use cases for Fly/Walk include:

Navigating

This can be a quick way to navigate a large scene.

Positioning a camera

When activated from a camera view `Numpad0`, the camera will move along with you.

Recording camera movement

You can record the path you take by entering a camera view, enabling Auto Keying in the Timeline, starting animation playback, and finally activating Fly/Walk navigation. The path will be recorded as camera keyframes which can then be used for rendering.

> Animation playback can't be controlled while Fly/Walk navigation is active, so when you're done recording, you first need to exit the navigation with `LMB` before you can stop playback.

Walk Navigation

Reference

Mode::	All modes
Menu::	*View ‣ Navigation ‣ Walk Navigation*

This navigation method behaves like a typical first person game. It works with a combination of keyboard keys and mouse movement.

Usage

Move the mouse in the direction you want to look and use the keys listed below to walk around the scene.

When you are happy with the new view, press `LMB` to confirm. In case you want to go back to where you started, press `Esc` or `RMB`.

All these keys are also listed in the Status Bar while navigating. Settings like mouse sensitivity and default speed can be adjusted in the Preferences.

`W`/`Up`	Move forward.
`S`/`Down`	Move backward.
`A`/`Left`	Strafe left.
`D`/`Right`	Strafe right.

`E`	Move up (global) – only available if *Gravity* is off.
`Q`	Move down (global) – only available if *Gravity* is off.
`R`	Move up (local) – only available if *Gravity* is off.
`F`	Move down (local) – only available if *Gravity* is off.
`Spacebar`	Teleport to the location at the crosshair (offset by the *Camera Height* value set in the Preferences).
`WheelUp`/`NumpadPlus`	Increase the movement speed.
`WheelDown`/`NumpadMinus`	Decrease the movement speed.
`Shift`	Speed up the movement temporarily.
`Alt`	Slow down the movement temporarily.
`V`	Jump – only available if *Gravity* is on.
`Tab`	Toggle *Gravity*.

`Z`	Correct the Z axis of the view (smoothly roll it to ensure it's upright, not tilted to a side).
`Period`	Increases the jump height.
`Comma`	Decreases the jump height.

Fly Navigation

Reference

Mode::	All modes
Menu::	*View ‣ Navigation ‣ Fly Navigation*

On activation, the cursor is centered inside a rectangle that defines a safe zone. When the cursor is outside this zone, the view will rotate/pan.

Usage

Move the mouse outside the safe zone in the direction you want to look.

Click `LMB` or press `Spacebar` to keep the current view and exit Fly navigation. In case you want to go back to where you started, press `Esc` or `RMB`.

`W/Up`	Accelerate forward.
`S/Down`	Accelerate backward.
`A/Left`	Accelerate left.

`D/Right`	Accelerate right.
`E`	Accelerate upward.
`Q`	Accelerate downward.
`MMB`	Drag to pan the view. Flying will pause while you’re doing this.
`WheelUp/NumpadPlus`	Increase the acceleration in the direction of motion. If there is no motion, start accelerating forward.
`WheelDown/NumpadMinus`	Decrease the acceleration in the direction of motion. If there is no motion, start accelerating backward.
`Alt`	Slow down as long as the key is held, until the view eventually comes to a standstill.
`Ctrl`	Disable rotation – while held, the view rotation doesn’t influence the flight direction. This allows you to fly past an object, keeping it centered in the view even as you fly away from it.
`X`	Toggle X axis correction. If enabled, the view will smoothly pitch to look at the horizon when the cursor is in the safe zone.

Z	Toggle Z axis correction. If enabled, the view will smoothly roll to an upright orientation.

Aligning

Reference

Menu:: *View ‣ Align View*

These options allow you to align and orient the view.

Align View to Active
: Aligns the view to a certain local axis of the active object, bone, or (in Edit Mode) the normal of the active face. The view also becomes orthographic.

  To return to the regular (untilted) perspective view, you can first press `Numpad3` to align to the global X axis, then orbit with `MMB`.

Align Active Camera to View `Ctrl-Alt-Numpad0`
: Moves and rotates the active camera so it matches the current viewpoint.

Align Active Camera to Selected
: Moves the active camera (without changing its orientation) so that its view frames the selected objects.

Center Cursor and Frame All `Shift-C`
: Moves the 3D Cursor back to the world origin and changes the view so that you can see everything in your scene.

Center View to Cursor
: Centers the view on the 3D Cursor.

View Lock to Active
: Centers the view on the active object and makes it the point of interest. The view will continue orbiting around the object even if you pan to a

different location. In addition, it will follow the object if it moves.

View Lock Clear

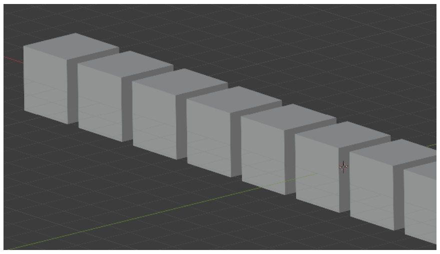
Returns the view to how it was before using *View Lock to Active*.

Perspective/Orthographic

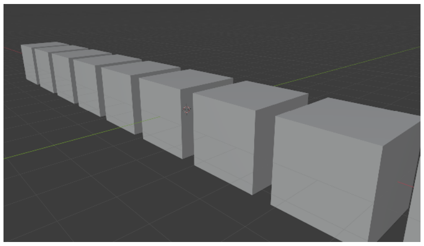
Reference

Mode:: All modes
Menu:: *View ‣ Perspective/Orthographic*
Shortcut:: `Numpad5`

This operator changes the projection of the viewport camera. Each 3D Viewport supports two different types of projection. These are demonstrated in the Fig. below.



Orthographic projection.



Perspective projection.

Our eyes are used to perspective viewing where distant objects appear smaller. Orthographic projection often seems a bit odd at first, because objects stay the same size regardless of their distance. It is like viewing the scene from an infinitely distant point. Nevertheless, orthographic viewing can be very useful, because it provides a more “technical” insight into the scene, making it easier to model and judge proportions.

Options

To toggle between the two projections for the 3D Viewport, select *View ‣ Perspective/Orthographic* or use the shortcut `Numpad5`. Changing the projection for a 3D Viewport does not affect the way the scene will be rendered. Rendering is in perspective by default. If you need to create an orthographic rendering, select the camera, go to the Camera tab in the Properties editor, and set the Type in the Lens panel to *Orthographic*.

See also

- Auto-Perspective Preference
- Camera Lens Type
- Camera Projections

Local View

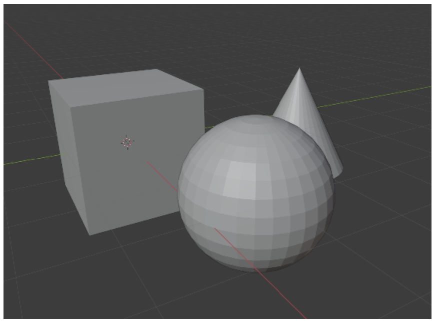
Toggle Local View

Reference

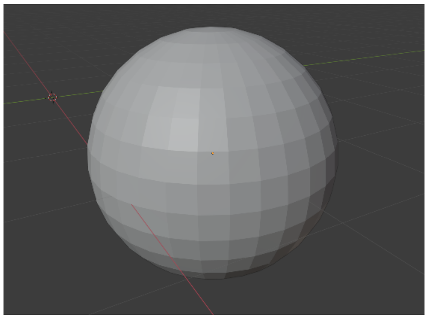
Mode::	All modes
Menu::	*View* ‣ *Local View* ‣ *Toggle Local View*
Shortcut::	`NumpadSlash`, `Slash`

Global view shows all 3D objects in the scene. Local view isolates the selected object(s) so that they are the only ones visible in the viewport. This is useful for working on objects that are obscured by others, or to speed up the viewport performance in heavy scenes. Local view is contextual, meaning that it can be set per 3D Viewport.

You can toggle between *Global* and *Local View* by selecting the option from the View menu or using the shortcut `NumpadSlash`.



Global View.



Local View.

Note

In local view, the 3D cursor is not locked to the scene. Instead, each view has an independent cursor location.

Tip

Accidentally pressing `NumpadSlash` can happen rather often if you are new to Blender, so if a bunch of the objects in your scene seem to have mysteriously vanished, try pressing `NumpadSlash` again.

Remove from Local View

Reference

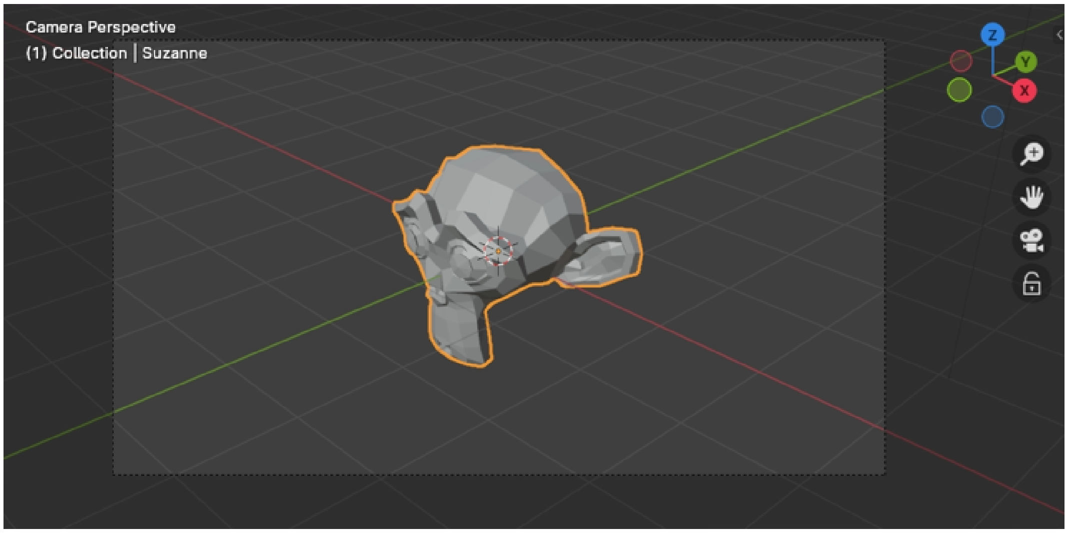
Mode::	All modes
Menu::	*View ‣ Local View ‣ Remove from Local View*
Shortcut::	`Alt-NumpadSlash`, `Alt-Slash`

Objects can be removed from Local View by selecting them and using the *Remove from Local View* operator. This will move them back to the global view. If the last remaining object is removed, the local view will be left empty and you will have to exit it to see any objects.

Hint

This is useful when working with objects in dense scenes where painstakingly selecting objects to include in the local view isn't practical, especially when they intersect or are obscured by objects you don't want to include. In this case it's simpler to select many objects in a region and enter local view, then remove the ones you don't need.

Camera View



Demonstration of camera view.

The Camera view shows the current scene from the active camera’s viewpoint.

The Camera view can be used to virtually compose shots and preview how the scene will look when rendered. The rendered image will contain everything within the dashed frame.

See also

Camera Settings for details on how camera settings are used for display and rendering.

Hint

While in camera view, you can select the camera by clicking the dashed frame (assuming the camera object isn’t hidden).

Viewing the Active Camera

Reference

Mode:: All Modes

Menu:: *View* ▸ *Cameras* ▸ *Active Camera*, *View* ▸ *Viewpoint* ▸ *Camera*

Shortcut:: `Numpad0`

This switches the view to the active camera.

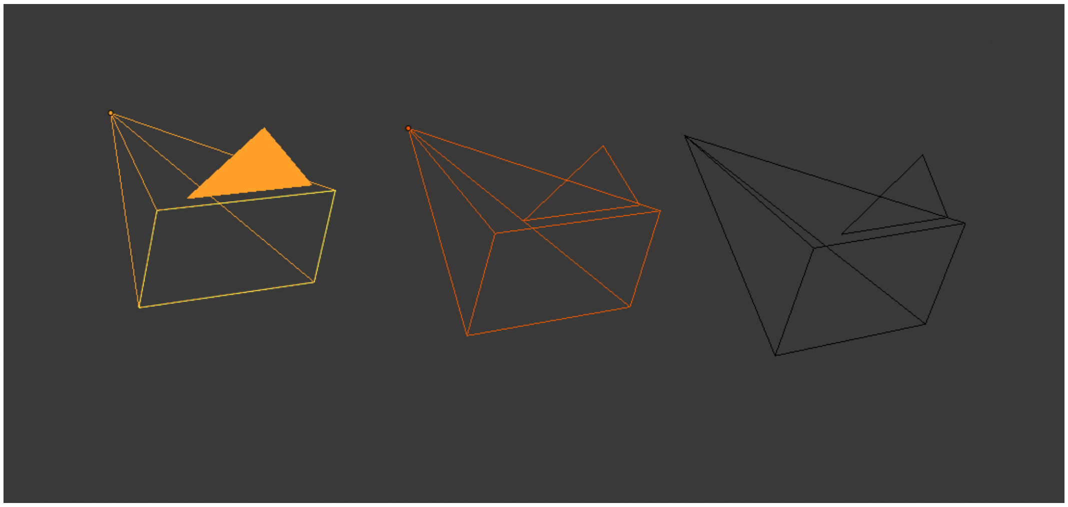
Setting the Active Camera

Reference

Mode:: Object Mode

Menu:: *View* ▸ *Cameras* ▸ *Set Active Object as Camera*

Shortcut:: `Ctrl-Numpad0`



Active camera (left) displayed with a solid triangle above it.

This sets the current active object as the active camera and switches to the camera view.

The active camera is the one that will be used for rendering, and which you'll look through when choosing camera view.

Another way of setting the active camera is through the *Scene* tab of the Properties.

Note

The active camera is normally defined on the scene level, so that it's the same across all 3D Viewports. However, it's also possible to make a camera the active one within one Viewport only. See Local Camera.

Animated Camera Switching

While a scene contains only one camera by default, it's possible to have multiple. You can then bind the cameras to specific time points in your animation to create jump cuts showing different viewpoints. See Animating Cameras.

Frame Camera Bounds

Reference

Mode::	All Modes
Menu::	*View* ‣ *Cameras* ‣ *Frame Camera Bounds*
Shortcut::	`Home`

Centers the camera view inside the 3D Viewport's screen area and resizes the view to fit within the area's bounds.

Zoom Camera 1:1

Reference

Mode:: All Modes
Menu:: *View ‣ Navigation ‣ Zoom Camera 1:1*

Zooms the view so that the camera frame has the exact same size as the output resolution. This allows you to preview exactly how large objects will be in the rendered image/animation.

Camera Positioning

There are several different ways to position the camera in your scene. Some of them are explained below.

Hint

The active "camera" might be any kind of object, meaning these actions can also be used to position and aim a light for example.

Align Active Camera to View

Reference

Mode:: Object Mode
Menu:: *View ‣ Align View ‣ Align Active Camera to View*
Shortcut:: `Ctrl-Alt-Numpad0`

Moves and rotates the camera so it perfectly matches your current viewport view.

Camera Navigation

By enabling Lock Camera to View in *Sidebar ‣ View* and switching to camera view or toggle the lock navigation gizmo button when in camera view, the camera will become "glued" to the view and follow it around as you navigate.

See also

Fly/Walk Navigation for first person navigation that moves the active camera too.

Roll, Pan, Dolly, and Track

To perform these camera moves, the camera must first be selected so transform operations apply to it. The following actions also assume that you are in camera view. Having done so, you can now manipulate the camera using the same tools that are used to transform any object:

Roll

Press `R` to enter object rotation mode. The default will be to rotate the camera along its local Z axis (the axis orthogonal to the camera view), which is the definition of a camera "roll".

Vertical Pan or Pitch

This is just a rotation along the local X axis. Press `R` to enter object rotation mode, then `X` twice. (The first press selects the *global* axis, the second the *local* axis. This works with any axis; see Axis Locking).

Horizontal Pan or Yaw

This corresponds to a rotation around the camera's local Y axis. Press `R`, then `Y` twice.

Dolly

To dolly the camera, press `G` then `MMB` (or `Z` twice).

Sideways Tracking

Press `G` and move the mouse (you can use `X` or `Y` twice to get purely horizontal or vertical tracking).

Viewpoint

The menu *View* ▸ *Viewpoint* lets you align the viewing direction to a specific axis. This can also be done using the Navigation Gizmo or the following hotkeys:

Top::	`Numpad7`
Front::	`Numpad1`
Right::	`Numpad3`
Bottom::	`Ctrl-Numpad7`
Back::	`Ctrl-Numpad1`
Left::	`Ctrl-Numpad3`

The above hotkeys align the view to a global (world) axis. You can also align to a local axis of the selected item by additionally holding `Shift`. This way, you can for example view any mesh face head-on, no matter how it's oriented. (To get out of this local viewpoint, simply align to a global axis again.)

The view can also be aligned by holding `Alt-MMB` and dragging the mouse in a certain direction.

View Regions

Clipping Region

Reference

Mode:: All modes
Menu:: *View ‣ View Regions ‣ Clipping Region…*
Shortcut:: `Alt-B`

Allows you to define a clipping region to limit the 3D Viewport display to a portion of 3D space. It can assist in the process of working with complex models and scenes.

Once activated, you have to draw a rectangle with the mouse. It becomes a clipping volume of four planes:

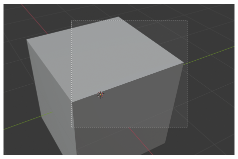
- A right-angled parallelepiped (of infinite length) if your view is orthographic.
- A rectangular-based pyramid (of infinite height) if your view is in perspective.

Once clipping is used, you will only see what's inside the volume you defined. Tools such as paint, sculpt, selection, transform snapping, etc. will also ignore geometry outside the clipping bounds.

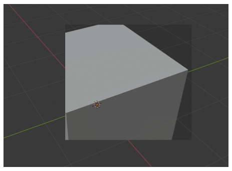
To delete this clipping, press `Alt-B` again.

Example

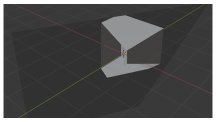
Region/Volume clipping.



Selecting a region.



Region selected.



View rotated.

The *Region/Volume clipping* image shows an example of using the clipping tool with a cube. Start by activating the tool with `Alt-B`. This will generate a dashed cross-hair cursor. Click with the `LMB` and drag out a rectangular region. Now clipping is applied against that region in 3D space. Use the `MMB` to rotate the view and you will see that only what is inside the clipping volume is visible. All the editing tools still function as normal, but only within the clipping volume.

The dark gray area is the clipping volume itself. Once clipping is deactivated with another `Alt-B`, all of 3D space will become visible again.

Render Region

Reference

Mode::	All modes
Menu::	*View ‣ View Regions ‣ Render Region…* *View ‣ View Regions ‣ Clear Render Region*
Shortcut::	Mark: `Ctrl-B` Clear: `Ctrl-Alt-B`

Allows you to limit rendering to a 2D rectangular area. If you’re busy tweaking just a small part of the scene, it can be quite wasteful to have the whole viewport in Rendered shading mode or make full-frame renders, so this feature lets you save time.

You can define Render Regions in two different contexts:

Contextual Views

By default, the 3D Viewport only shows the scene from one viewpoint. By using Quad Views, you can see it from multiple viewpoints at the same time, which gives more context about the changes you're making.

Quad View

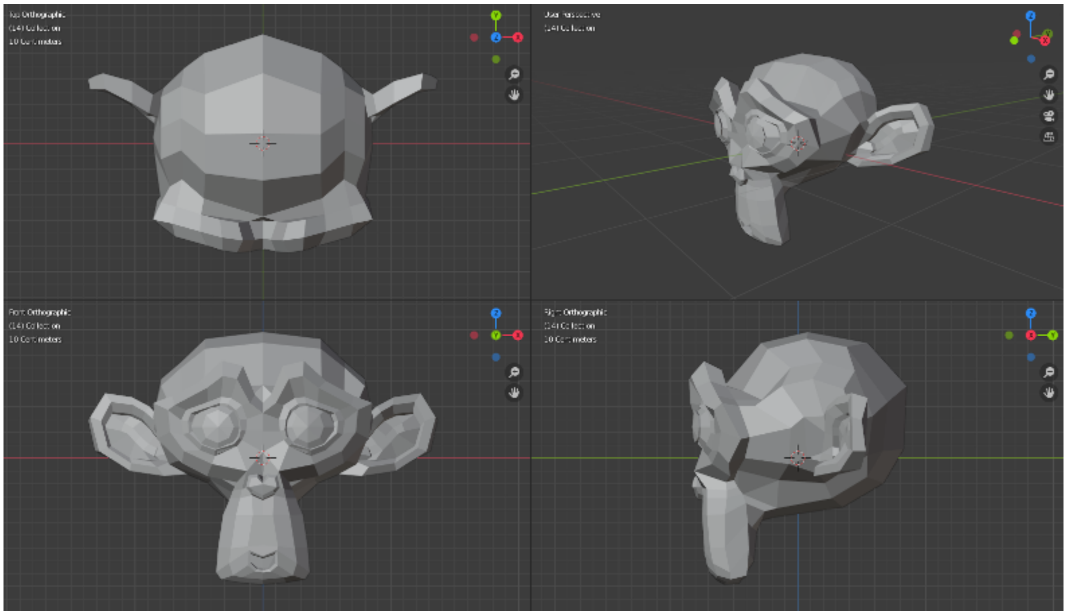
Reference

Mode:: All modes
Menu:: *View* ▸ *Area* ▸ *Toggle Quad View*
Shortcut:: `Ctrl-Alt-Q`

Toggling Quad View will split the 3D Viewport into four views: three orthographic side views and one user perspective view.

Note

Quad View is different from splitting the area and aligning the views manually. In Quad View, the four views are still part of a single 3D Viewport, so that they share the same display options.


Top Orthographic
(14) Collection
10 Centimeters
User Perspective
(14) Collection
Front Orthographic
(14) Collection
10 Centimeters
Right Orthographic
(14) Collection
10 Centimeters

Quad View.

Options

Reference

Mode::	All modes
Menu::	*Sidebar* ‣ *View* ‣ *Quad View*

Lock Rotation
When disabled, makes it possible to orbit in the orthographic views as well (turning them into perspective views instead).

Sync Zoom/Pan
Syncs the view position between side views. (Requires *Lock Rotation* to be enabled.)

Clip Contents
Clip objects based on what is visible in the other side views.

3D Cursor

The 3D Cursor is a point in space that has both a location and a rotation. It's used for a number of purposes. For example, it defines where newly added objects are placed, and can also be used to manually position and orient the transform gizmo (see Pivot Point and Transform Orientation). Some tools, such as Bend, also use the Cursor.

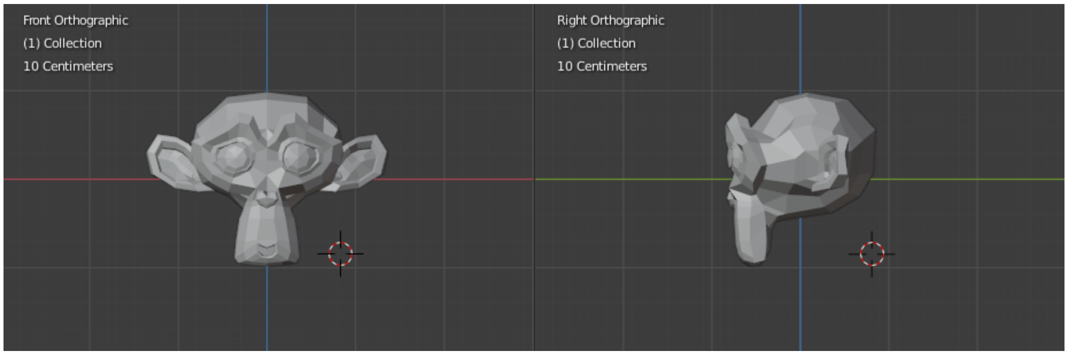
Placement

There are a few methods to position the 3D Cursor.

Direct Placement with the Mouse

Reference

Mode::	Object, Edit, and Pose Mode
Tool::	Cursor
Shortcut::	`Shift-RMB`


Front Orthographic
(1) Collection
10 Centimeters
Right Orthographic
(1) Collection
10 Centimeters

Positioning the 3D Cursor with two orthogonal views.

The Cursor tool offers the most flexibility. Simply select it in the Toolbar and click a point in the scene with `LMB` to place the 3D Cursor there. In the tool settings, you can choose how it should be oriented: by default, it matches the view orientation, but you can also make it match the surface normal of a piece of geometry, or the transform orientation.

Alternatively, you can press `Shift-RMB` with any tool selected. In this case, the 3D Cursor will always be aligned to the view orientation.

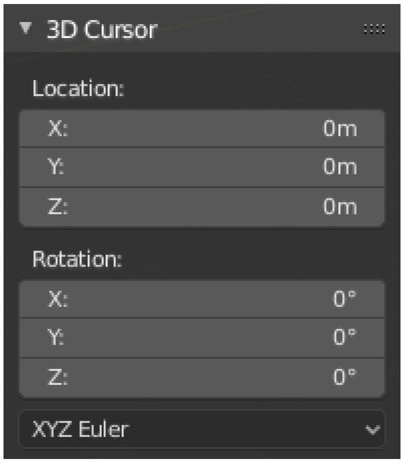
For accuracy you should use two perpendicular orthogonal 3D Viewports, i.e. any combination of top `Numpad7`, front `Numpad1` and side `Numpad3`. That way you can control the positioning along two axes in one view and determine the depth in the other.

By default, the depth of the geometry under the cursor is used. This can be disabled using the *Cursor Surface Project* toggle in the Preferences.

Sidebar

Reference

Mode::	All Modes
Panel::	*Sidebar region* ‣ *View* ‣ *3D Cursor*



The 3D Cursor panel of the Sidebar region.

The 3D Cursor can also be positioned and oriented by editing the respective values in the Sidebar.

Snapping

Reference

Mode::	Object, Edit, and Pose Mode
Menu::	*Object/Mesh/… ‣ Snap ‣ Cursor to …*
Shortcut::	`Shift-S`

One more way of positioning the 3D Cursor is through the Snap menu, which allows you to move the Cursor to the origin of the selected object for example.

Selecting

This page discusses selection tools that are specific to the 3D Viewport. The generic selection tools are described in the Interface section.

The 3D Viewport has two keys that affect selection:

Select by Origin `Ctrl`
: Selects objects by their origin rather than their geometry.

Selection Menu `Alt`
: Shows a menu in case there are multiple objects under the mouse cursor, making it easier to select the one you want.

These keys can be combined to get a selection menu based on object origins.

The mode-specific selection pages are listed below.

Object Mode

- Object Mode

Edit Mode

- Mesh Edit Mode
- Curve Edit Mode
- Surface Edit Mode
- Metaball Edit Mode
- Text Edit Mode
- Grease Pencil Edit Mode
- Bone Edit Mode
- Lattice Edit Mode

Pose Mode

- Pose Mode

Particle Edit Mode

- Particle Edit Mode

Controls

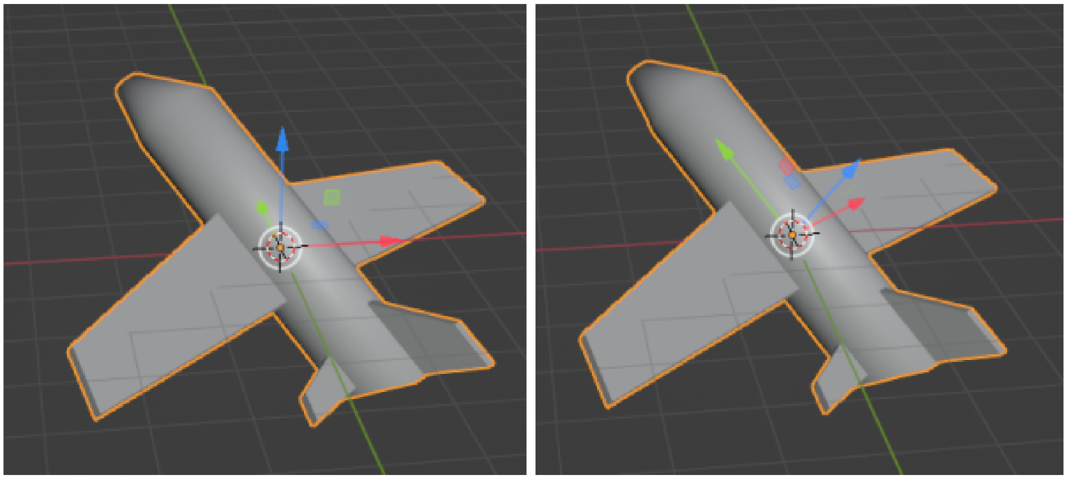
- Transform Orientation
  - Orientations
- Pivot Point
  - Pivot Types
- Snapping
  - Snap Base
  - Snap Target
  - Snap Target for Individual Elements
  - Target Selection
  - Affect
  - Rotation Increment
- Proportional Editing
  - Controls
  - Object Mode
  - Edit Mode
  - Example

Transform Orientation

Reference

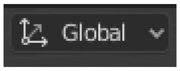
Mode:: Object and Edit Modes
Panel:: *Header ‣ Transform Orientation*
Shortcut:: `Comma`

The *Transform Orientation* determines the orientation of the Object Gizmo. Changing this orientation can make it easier to perform transformations in the direction you want.



With the default Global transform orientation (left) it's tricky to move the plane in the direction it's facing, but with Local (right) it's easy.

The Transform Orientation can be changed using a selector in the 3D Viewport's header:



Transform Orientation selector.

The orientation can also be changed temporarily while performing a hotkey-based transformation with axis locking. For example, if you first press `G` to start moving an object, then `X` to lock to the orientation's X axis, and finally `X` a second time, you'll get a lock to an alternative orientation: the Local orientation if it was Global previously, and the Global orientation otherwise.

In addition to the builtin orientations, you can also define your own (see Custom Orientations below).

Orientations

Global

Align the transformation axes to world space. The world axes are shown by the Navigation Gizmo in the top right corner of the viewport, as well as the *Grid Floor*.

Local

Align the transformation axes to the active object's orientation.

Normal

In Edit Mode, orient the transformation axes so that the Z axis of the gizmo matches the average Normal of the selected elements.

In Object Mode, this is equivalent to *Local* orientation.

Gimbal

Orient the transformation axes to visualize the workings of the object's Rotation Mode. This is specifically useful for the Euler modes, where the object is rotated one axis at a time: the rotation axes don't stay perpendicular to each other and might even overlap, a phenomenon known as gimbal lock that complicates animation.

View

Align the transformation axes to the view (meaning they change as you orbit around):

- X: Left/Right
- Y: Up/Down
- Z: Towards/Away from the screen

Cursor

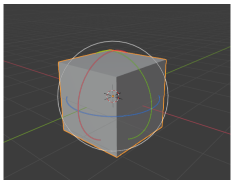
Align the transformation axes to the 3D Cursor.

Parent

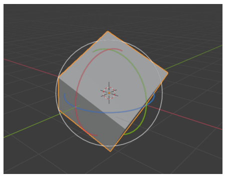
Align the transformation axes to the Parent.

Examples

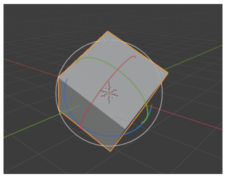
Cube with the rotation gizmo active in multiple transform orientations.



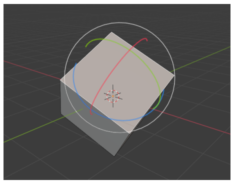
Default cube with Global transform orientation selected.



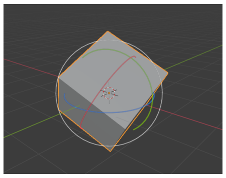
Rotated cube with Global orientation, gizmo has not changed.



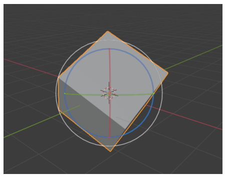
Local orientation, gizmo matches the object's rotation.



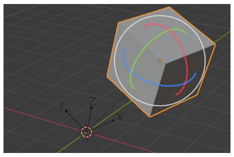
Normal orientation, in Edit Mode.



Gimbal transform orientation.



View transform orientation.



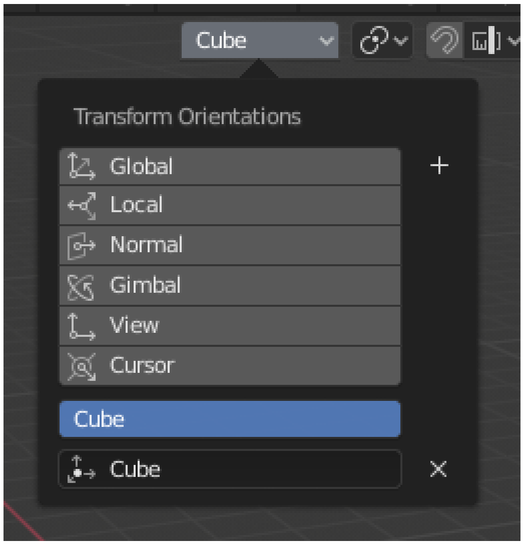
Parent transform orientation. Cube parented to rotated empty.

Custom Orientations

Reference

Mode::	Object and Edit Modes
Panel::	*Header* ‣ *Transform Orientation*

You can define custom transform orientations using objects or mesh elements. Custom orientations defined from an object use the *Local* orientation of that object, whereas those defined from mesh elements (vertices, edges, faces) use the average *Normal* orientation of those elements.


Cube
Transform Orientations
Global
Local
Normal
Gimbal
View
Cursor
+
Cube
Cube
×

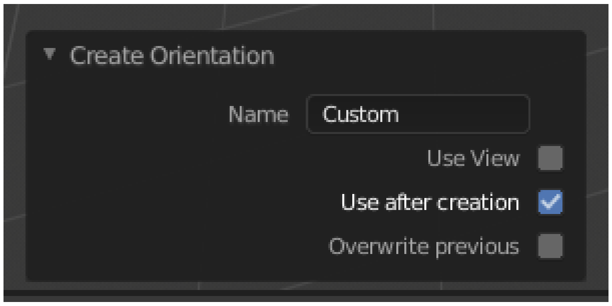
Transform Orientation panel.

The *Transform Orientation* panel, found in the header of the 3D Viewport, can be used to select, add, remove, and rename transform orientations.

The default name for these orientations is derived from the selection. If it's an object it will take that object's name, if it's an edge it will be titled "Edge", and so on.

Create Orientation

To create a custom orientation, select an object or mesh element(s) and click the "+" button in the *Transform Orientation* panel.


Create Orientation

Name: Custom
Use View ☐
Use after creation ☑
Overwrite previous ☐

Create Orientation Adjust Last Operation panel.

Right after creating the orientation, the *Create Orientation* Adjust Last Operation panel gives a few options:

Name
    Text field for naming the new orientation.

Use View
    The new orientation will be aligned to the view space.

Use After Creation
    The new orientation stays selected.

Overwrite Previous
    If the new orientation is given an existing name, a suffix will be added to it's name to avoid overwriting the existing orientation, unless *Overwrite Previous* is checked, in which case it will be overwritten.

Delete Orientation

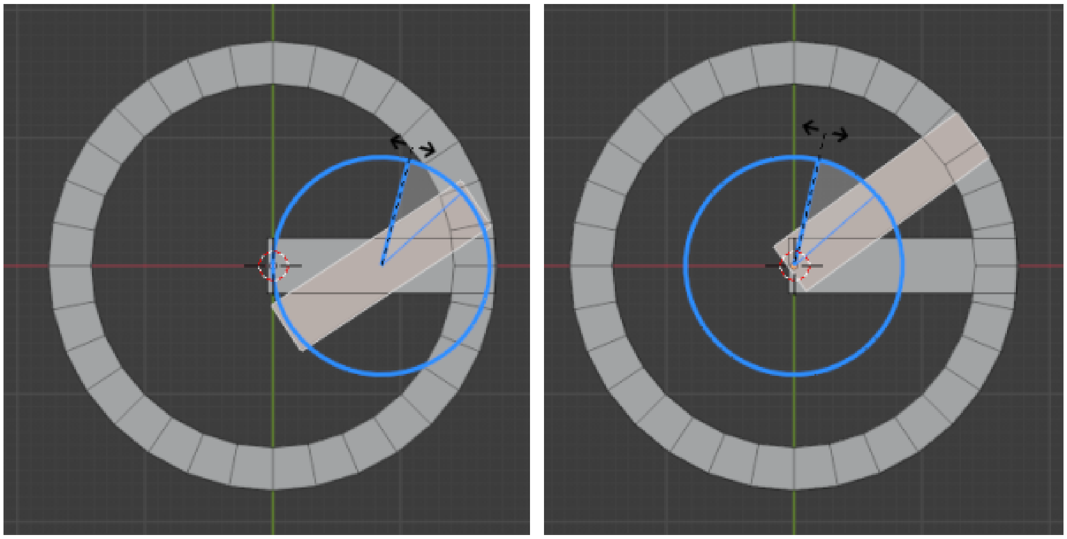
To delete a custom orientation, simply select it and click the × button.

Pivot Point

Reference

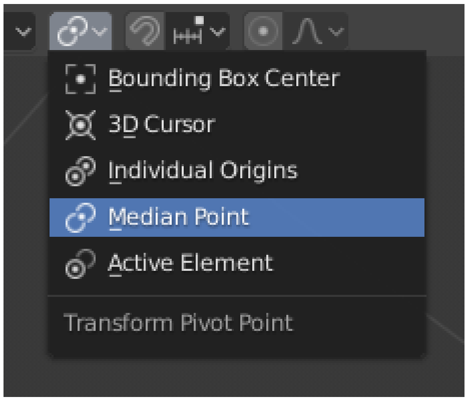
Mode:: Object Mode and Edit Mode
Header:: *Pivot Point*
Shortcut:: `Period`

The *Pivot Point* determines the location of the Object Gizmo. Changing this location can make it easier to perform transformations around the point you want.



With the default "Median Point" pivot point (left) it's tricky to bring the second wheel spoke into place, but with "3D Cursor" (right) it's easy.

The Pivot Point can be changed using a selector in the 3D Viewport's header:


Bounding Box Center
3D Cursor
Individual Origins
Median Point
Active Element
Transform Pivot Point

Pivot Types

- Bounding Box Center
  - In Object Mode
  - In Edit Mode
- 3D Cursor
  - Example
- Individual Origins
  - In Object Mode
  - In Edit Mode
- Median Point
  - In Object Mode
  - In Edit Mode
- Active Element
  - In Object Mode
  - In Edit Mode

Bounding Box Center

Reference

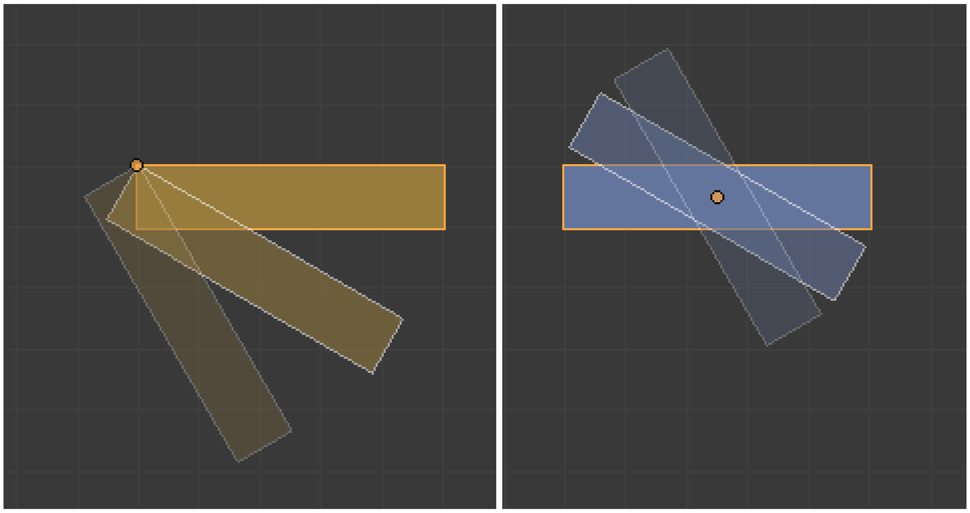
Mode:: Object Mode and Edit Mode
Header:: *Pivot Point ▸ Bounding Box Center*
Shortcut:: `Period`

In this mode, the pivot point lies at the center of the bounding box, which is a box that's wrapped as tightly as possible around the selection while still being aligned to the world axes.

In Object Mode

The pivot point becomes the center of the bounding box *around the selected objects' origin points*, not their geometry.

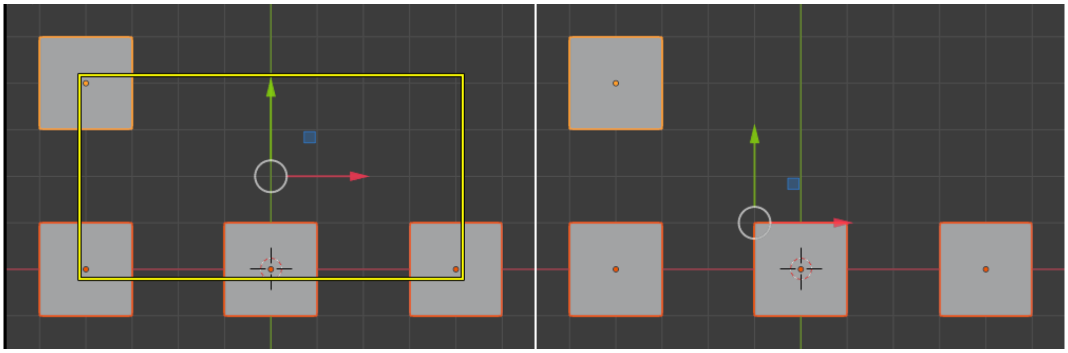
This means that, if you have a single object selected, the pivot point is the same as the object's origin point – which can be customized and doesn't have to be in the center. In the example below, the orange rectangle has it in a corner instead.



Single object rotation.

If you have multiple objects selected, the pivot point becomes the center of an imaginary box around their origins.

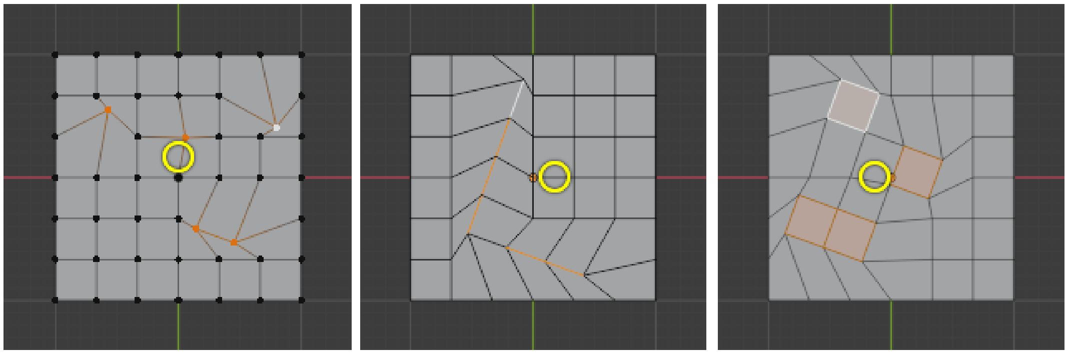
The image below shows the difference between Bounding Box Center and Median Point. The latter calculates the average position of the origins, meaning that the pivot point shifts towards the area with the most objects.



Difference between “Bounding Box Center” (left) and “Median Point” (right).

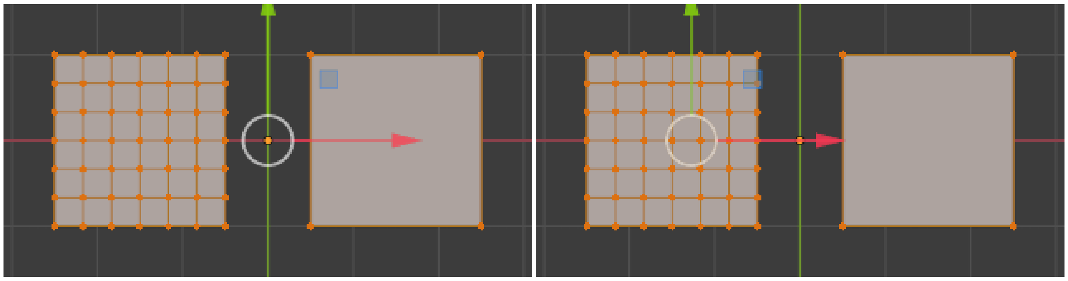
In Edit Mode

The pivot point becomes the center of the bounding box around the selected mesh elements.



The effects of rotation in different mesh selection modes. The pivot point is shown by a yellow circle.

Median Point may again give a different result.



Difference between “Bounding Box Center” (left) and “Median Point” (right).

3D Cursor

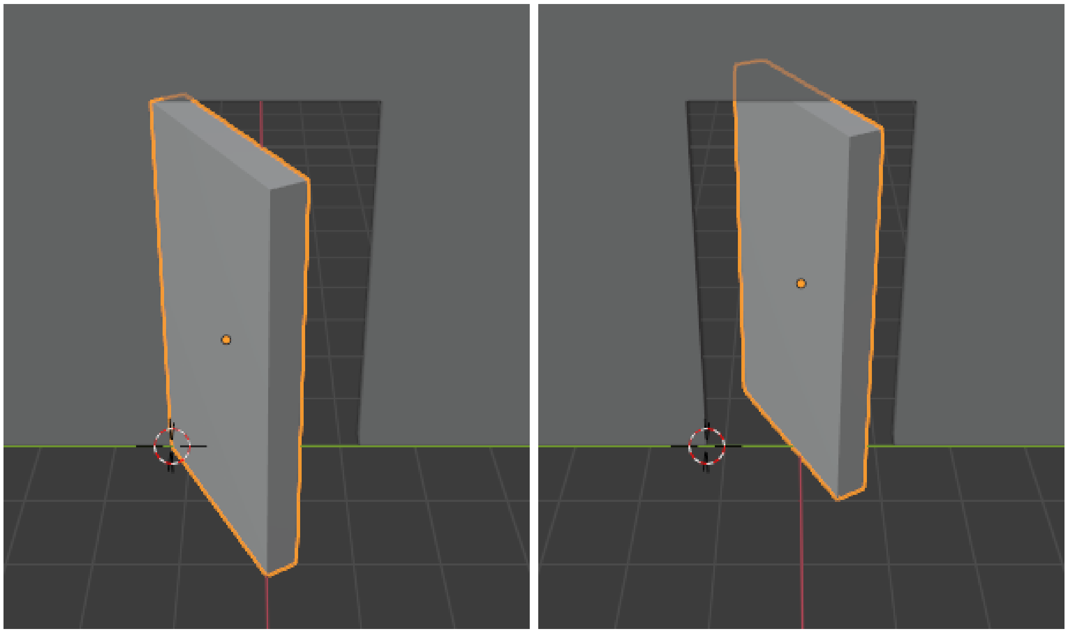
Reference

Mode:: Object Mode and Edit Mode
Header:: *Pivot Point ▸ 3D Cursor*
Shortcut:: `Period`

Places the pivot point at the location of the 3D Cursor.

Example

The image below shows the difference between rotating an object around the 3D Cursor (left) and rotating it around the Median Point (right).



Rotation around the 3D Cursor compared to the Median Point.

Individual Origins

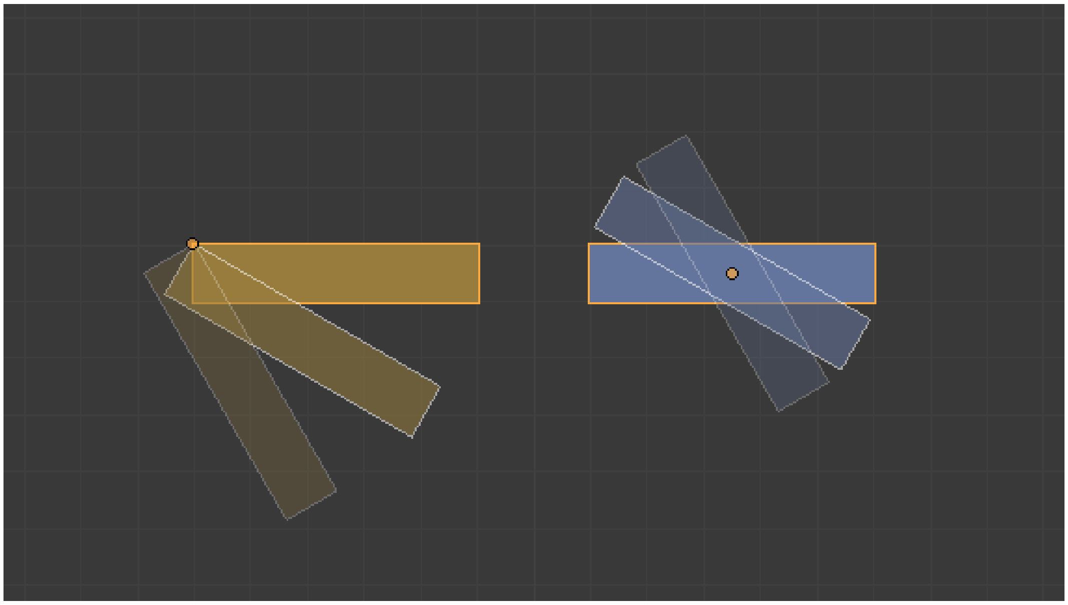
Reference

Mode:: Object Mode and Edit Mode
Header:: *Pivot Point ‣ Individual Origins*
Shortcut:: `Period`

While the other pivot point modes transform the whole selection around one point, Individual Origins transforms each item around itself.

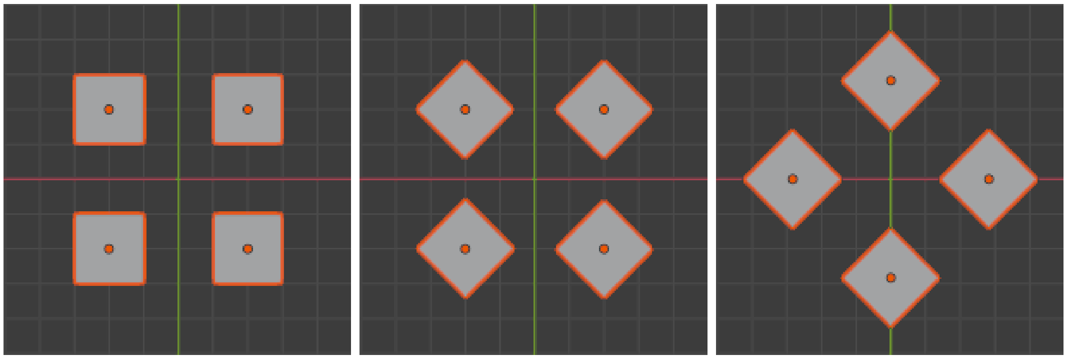
In Object Mode

Each object gets transformed around its [origin](), which is a point that can be chosen freely and doesn't have to be in the center. In the example below, the orange rectangle has it in a corner instead.

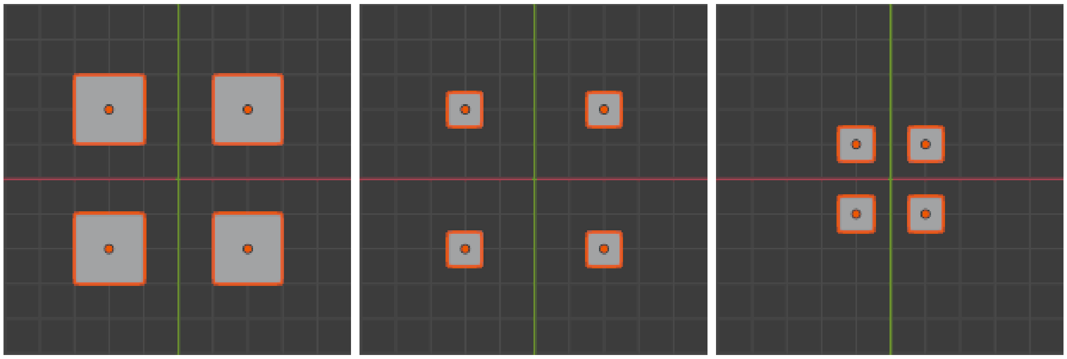


Rotation around individual origins.

The images below compare Individual Origins to [Median Point]().



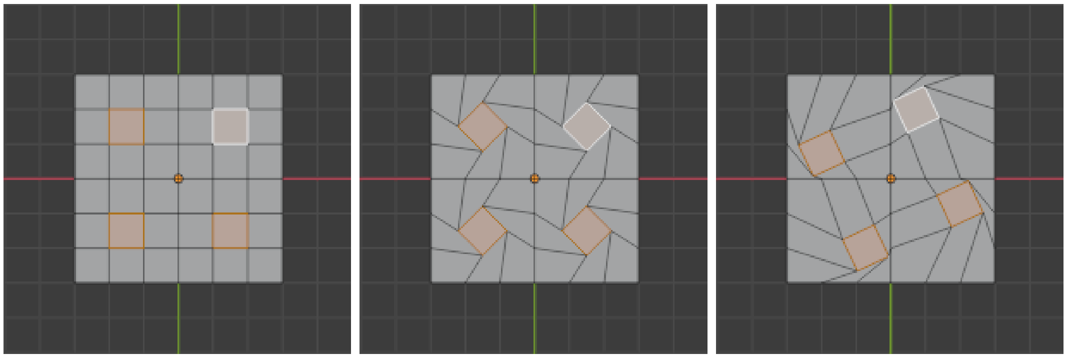
Starting situation, rotation around Individual Origins, rotation around Median Point.



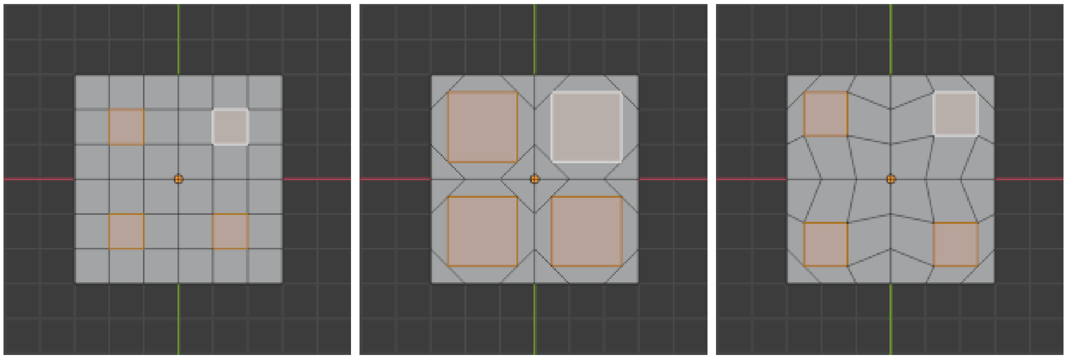
Starting situation, scaling using Individual Origins, scaling using Median Point.

In Edit Mode

Each selected element is transformed around its own centerpoint.



Starting situation, rotation around Individual Origins, rotation around Median Point.



Starting situation, scaling using Individual Origins, scaling using Median Point.

When you transform adjacent faces or edges, they are treated as a single element (meaning they don’t become disconnected).

Median Point

Reference

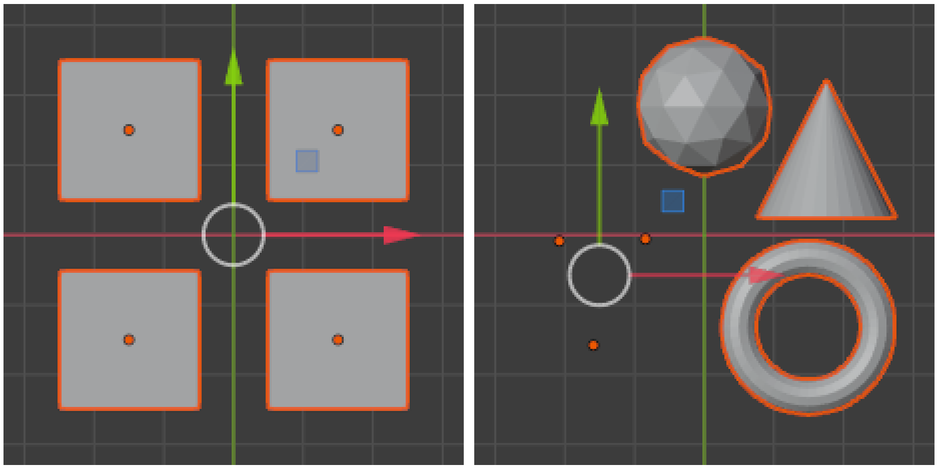
Mode::	Object Mode and Edit Mode
Header::	*Pivot Point ▸ Median Point*
Shortcut::	`Period`

Places the pivot point at the averaged-out position of the selected items.

In Object Mode

In Object Mode, the Median Point is the averaged-out position of the origins of the selected objects. The shape and size of the objects is not taken into account.

Origins can be chosen freely and can even lie outside their object's geometry, so that the Median Point is not always what you might expect.

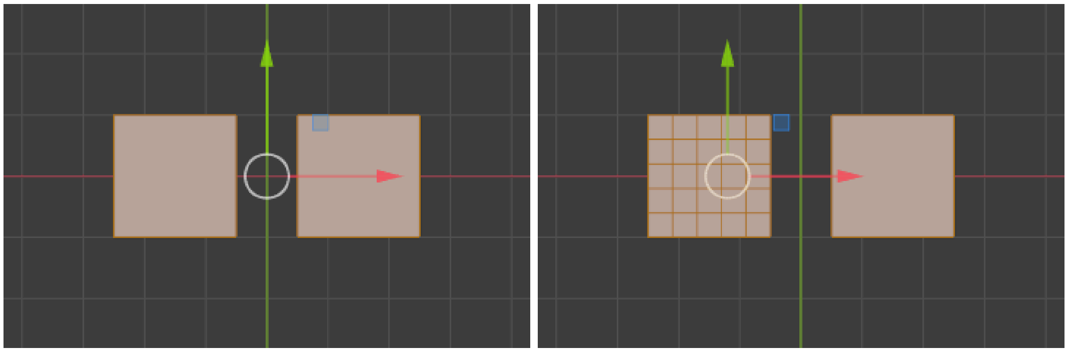


Median points in Object Mode.

In Edit Mode

In Edit Mode, the Median Point is the averaged-out position of the selected vertices. This means that the pivot point will shift towards the area with the densest geometry.

In the example below, the pivot point lies perfectly in the middle if both cubes have the same number of vertices, but heavily leans towards the side if one cube is subdivided – even though both cubes still have the same size.



Median points in Edit Mode.

Active Element

Reference

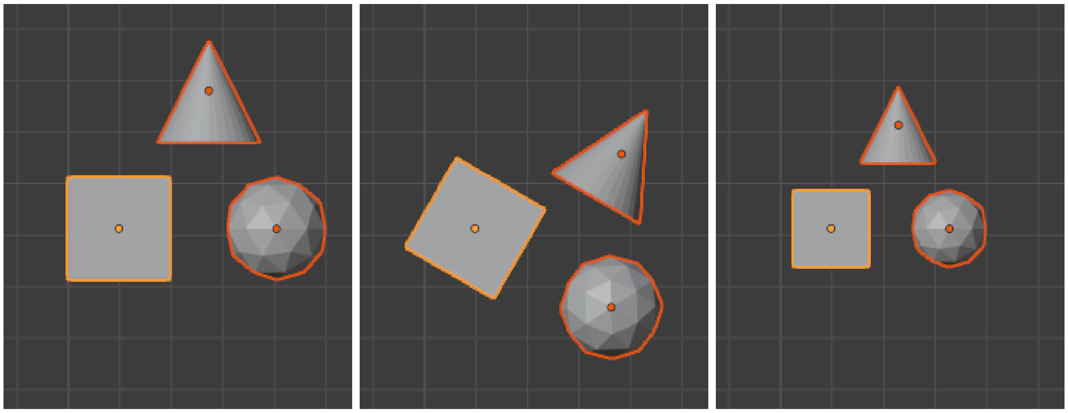
Mode::	Object Mode and Edit Mode
Header::	*Pivot Point ▸ Active Element*
Shortcut::	`Period`

Places the pivot point at the active element, which is the element that was selected most recently.

In Object Mode

When in Object Mode, rotation and scaling happen around the origin of the active object, which is the element with a lighter outline than the others.

The effect of the pivot point is shown in the image below, where the active object (the cube) remains in the same location while the others move.

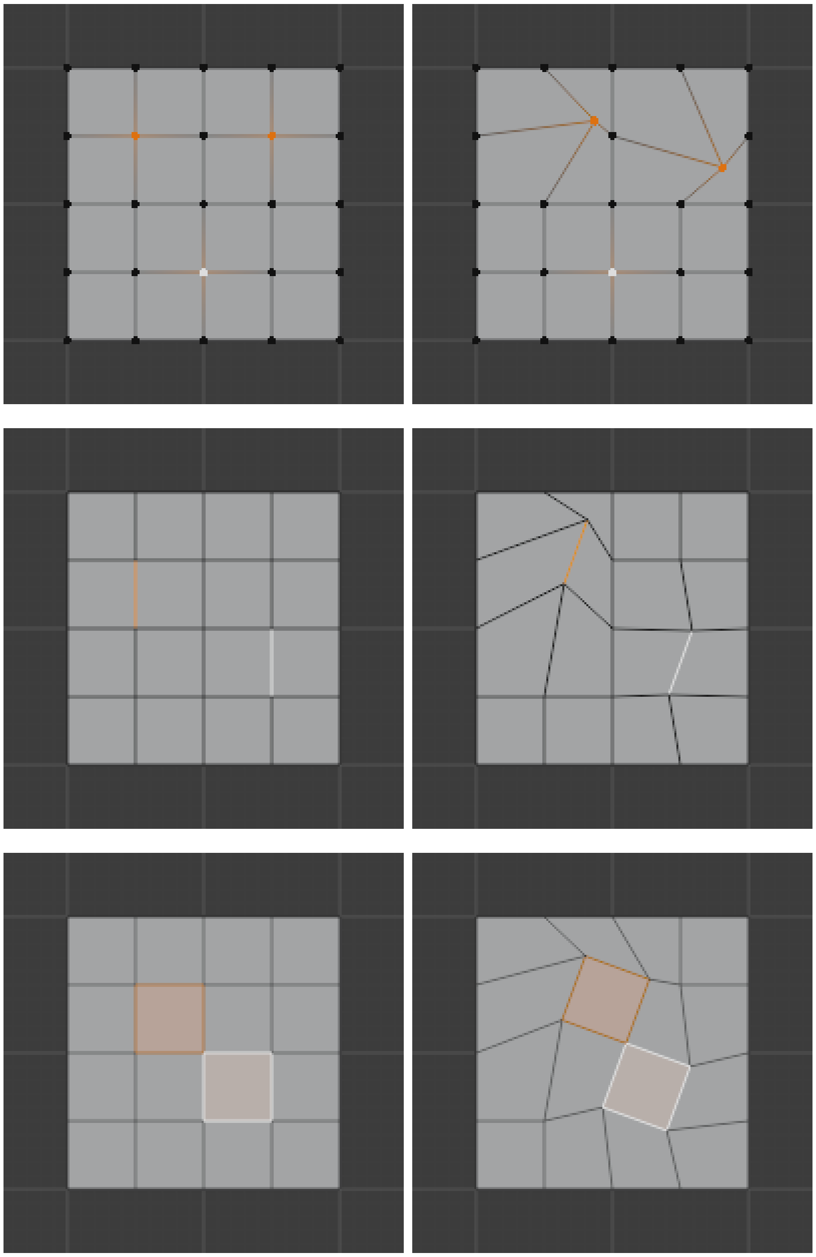


Starting point, rotation, and scaling.

In Edit Mode

When in Edit Mode, rotation and scaling happen around the centerpoint of the active element, which is the element with a white outline. That centerpoint remains in the same location while everything else is transformed around it.

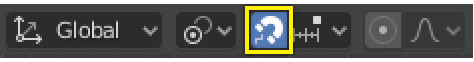
The image below illustrates rotation around the active vertex, edge, and face. Each time, the active element rotates in place, while the others “orbit” around it. In the case of vertices, the active vertex is not changed at all, as a vertex on its own is just a point that has no concept of rotation.



Left column: starting situation, right column: after rotation.

Snapping

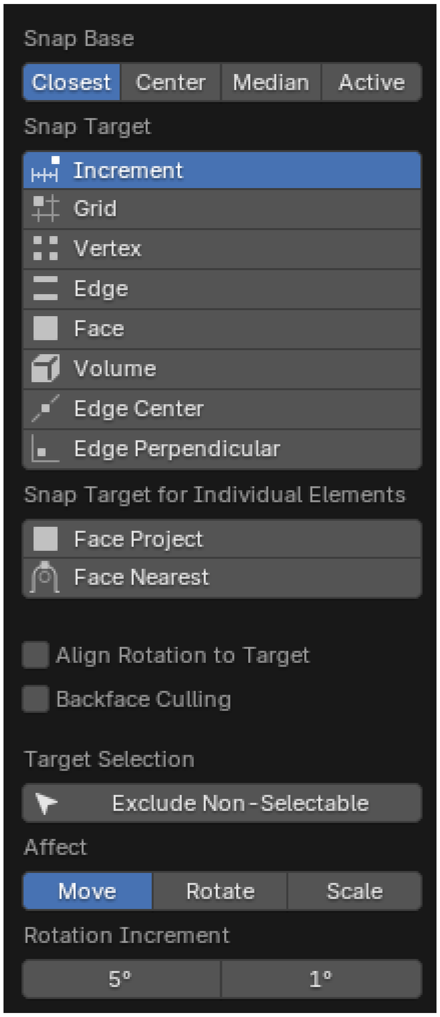
Reference

Mode:: Object, Edit, and Pose Mode
Header:: *Snap* ()
Shortcut:: `Shift-Tab`

Snapping lets you easily align objects and mesh elements to others. It can be toggled by clicking the magnet icon in the 3D Viewport's header, or more temporarily by holding `Ctrl`.

See also

Transform operators have their own snapping operators, see [Transform Modal Map]()


Snap Base
Closest
Center
Median
Active
Snap Target
Increment
Grid
Vertex
Edge
Face
Volume
Edge Center
Edge Perpendicular
Snap Target for Individual Elements
Face Project
Face Nearest
Align Rotation to Target
Backface Culling
Target Selection
Exclude Non-Selectable
Affect
Move
Rotate
Scale
Rotation Increment
5°
1°

Snap menu.

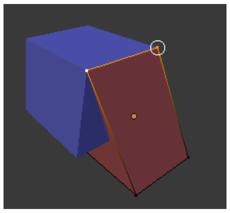
Snap Base

Reference

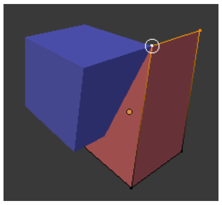
Mode::	Object, Edit, and Pose Mode
Header::	*Snapping ‣ Snap Base*
Shortcut::	`Shift-Ctrl-Tab`

Determines which point in the geometry is the snap base that will snap to the target.

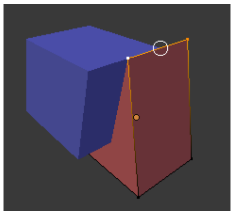
Active::	Snaps using the origin (in Object Mode) or center (in Edit Mode) of the active element.
Median::	Snaps using the median of the selection.
Center::	Snaps using the current transformation center (another word for the pivot point). This option is especially useful in combination with the 3D Cursor for choosing the snapping point completely manually.
Closest::	Snaps using the vertex that's closest to the target.



Closest.



Active.



Median.

Snap Target

Reference

Mode::	Object, Edit, and Pose Mode
Header::	*Snapping ‣ Snap Target*

Shortcut::	`Shift-Ctrl-Tab`

Determines the target which the selection will be snapped to.

Increment::	Snaps to grid points. When in Orthographic view, the snapping increment changes depending on the zoom level. This option snaps to an imaginary grid that starts at the selection's original location and has the same resolution as the viewport grid. In other words, it lets you move the selection in "increments" of the grid cell size.
Grid::	Snaps to the grid that's displayed in the viewport.
Vertex::	Snaps to the vertex that's closest to the mouse cursor.
Edge::	Snaps to the edge that's closest to the mouse cursor.
Volume::	Snaps the selection to a depth that's centered *inside* the object under the cursor. This is useful for positioning an Armature bone so it's centered inside a character's arm, for example; the other snapping options would place it on the arm's surface instead. While Blender also has Volume objects, this option is not related to those.
Edge Center::	Snaps to the centerpoint of the edge that's closest to the mouse cursor.
Edge Perpendicular::	Snaps to a specific point on the edge so that the line from the selection's original location (indicated by a white cross) to its new location is perpendicular to that edge.

Tip

Multiple snapping modes can be enabled at once using `Shift-LMB`.

Snap Target for Individual Elements

Reference

Mode::	Object, Edit, and Pose Mode
Header::	*Snapping ‣ Snap Target for Individual Elements*
Shortcut::	`Shift-Ctrl-Tab`

Type of element for individual transformed elements to snap to.

Face Project::	Snaps to the face that's under the mouse cursor. This can be used for bending a flat sheet so it snugly fits against a curved surface, for example. This works similar to the Shrinkwrap Modifier.
Face Nearest::	Individually snaps each object (in Object Mode) or vertex (in Edit Mode) to the face that's closest to its new location. This makes it possible to snap to occluded geometry.

Target Selection

Sets more detailed snapping options. The available options depend on the mode (Object/Edit) as well as the Snap Target.

Include Active *Edit Mode*

Snap to other mesh elements of the active object.

This checkbox is ignored if Proportional Editing is enabled.

Include Edited *Edit Mode*

Snap to other objects that are also in Edit Mode.

Include Non-Edited *Edit Mode*

Snap to other objects that are not in Edit Mode.

Exclude Non-Selectable

Snap only to objects that are selectable.

Align Rotation to Target
Rotates the selection so that its Z axis gets aligned to the normal of the target.

Backface Culling
Exclude back-facing geometry from snapping.

Snap to Same Target *Face Nearest*
Snap only to the object which the selection was nearest to before starting the transformation.

Face Nearest Steps *Face Nearest Edit Mode*
Breaks the overall transformation into multiple steps, performing a snap each time. This can give better results in certain cases.

Snap Peel Object *Volume*
If the target object is composed of several disconnected mesh islands that intersect each other, “Snap To Volume” will normally snap to the island which the mouse is hovering over, ignoring the other islands. By enabling “Snap Peel Object,” you can instead treat the target object as one connected whole.

Affect

Specifies which transformations are affected by snapping. By default, snapping only happens while moving something, but you can also enable it for rotating and scaling.

Rotation Increment

Angle used in incremental snapping for the rotation operator. The second value is the *Rotation Precision Increment*, used for finer transformations and activated by default with the `Shift` key.

Proportional Editing

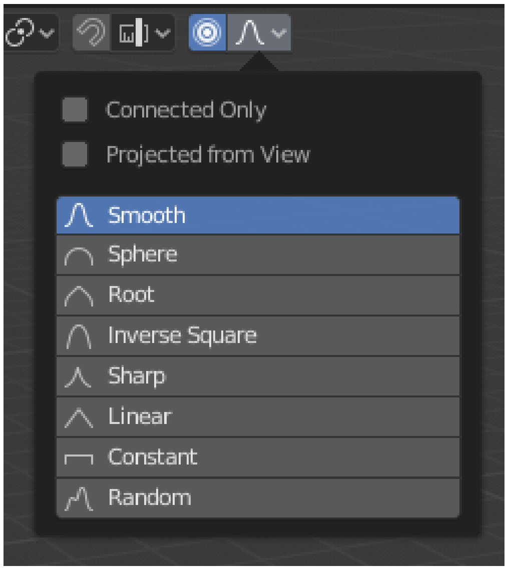
Reference

Mode:: Object and Edit Mode
Header:: *Proportional Editing*
Shortcut:: `O`

Proportional Editing is a way of transforming selected elements while also affecting the nearby unselected elements. The farther away an unselected element is, the less it will be affected (hence the "proportional"). This feature is very useful for smoothly deforming dense meshes.

Note

Blender also has a Sculpting workflow that contains brushes and tools for proportionally editing a mesh without seeing the individual vertices.


Connected Only
Projected from View
Smooth
Sphere
Root
Inverse Square
Sharp
Linear
Constant
Random

Proportional Editing popover.

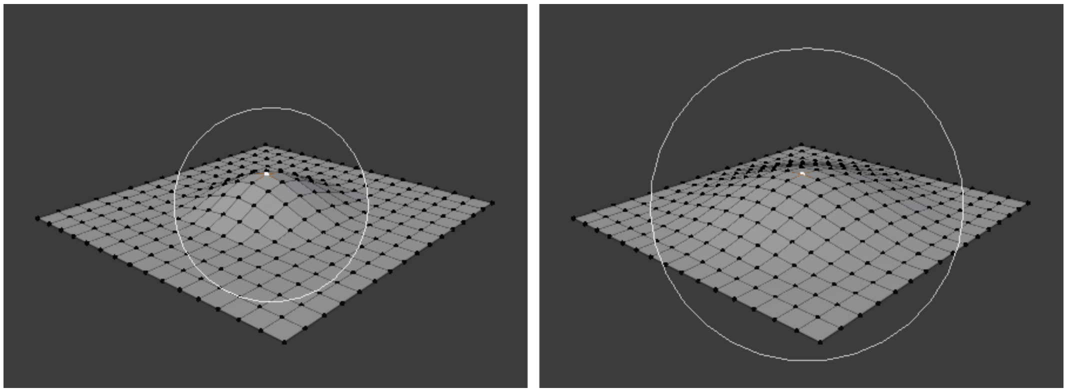
Controls

Disable `O`
: Proportional Editing is off, only selected vertices will be affected.

Enable `O`
: Vertices other than the selected vertex are affected, within a defined radius.

Proportional Size

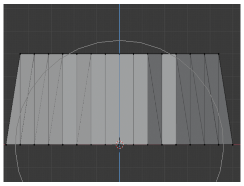
You can increase or decrease the radius of the tool's influence during a transform operation from the Proportional Editing popover or with `WheelUp`/`WheelDown`, or `PageUp`/`PageDown` respectively. As you change the radius, the points surrounding your selection will adjust their positions accordingly.



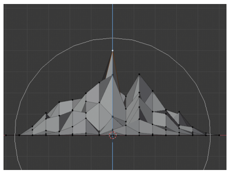
Influence circle.

Falloff

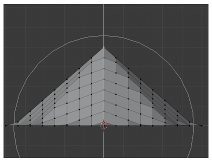
While editing, you can change the curve profile by either clicking the *Falloff* icon in the header or pressing `Shift-O` to get a pie menu.



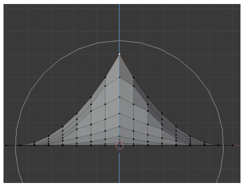
Constant, No Falloff.



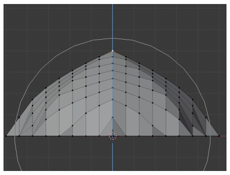
Random Falloff.



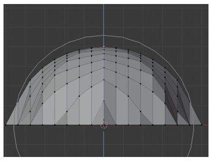
Linear Falloff.



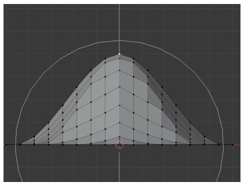
Sharp Falloff.



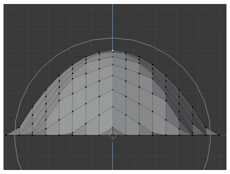
Root Falloff.



Sphere Falloff.



Smooth Falloff.

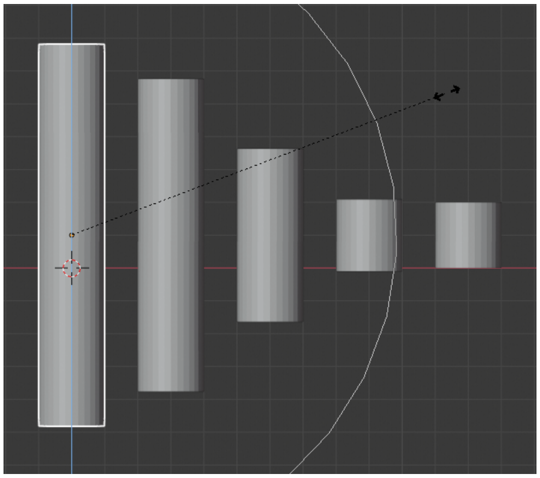


Inverse Square Falloff.

Object Mode

Proportional Editing is typically used in *Edit Mode*, but it can also be used in *Object Mode*. The tool then works on entire objects rather than individual mesh components.

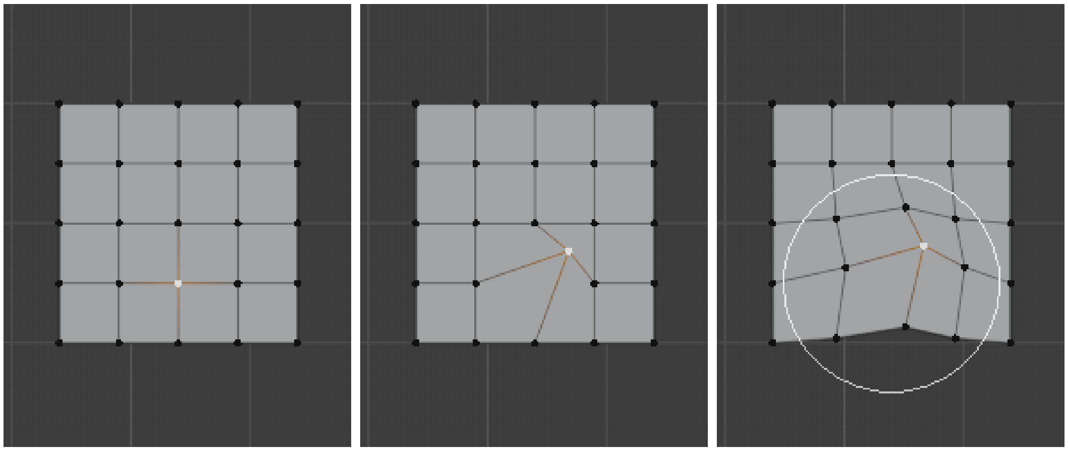
In the image below, the leftmost cylinder is being scaled up vertically, which also affects the cylinders near it.



Proportional Editing in Object Mode.

Edit Mode

When working with dense geometry, it can become difficult to make subtle adjustments without causing visible lumps and creases in the model's surface. When you face situations like this, Proportional Editing can help.



Proportional Editing in Edit Mode.

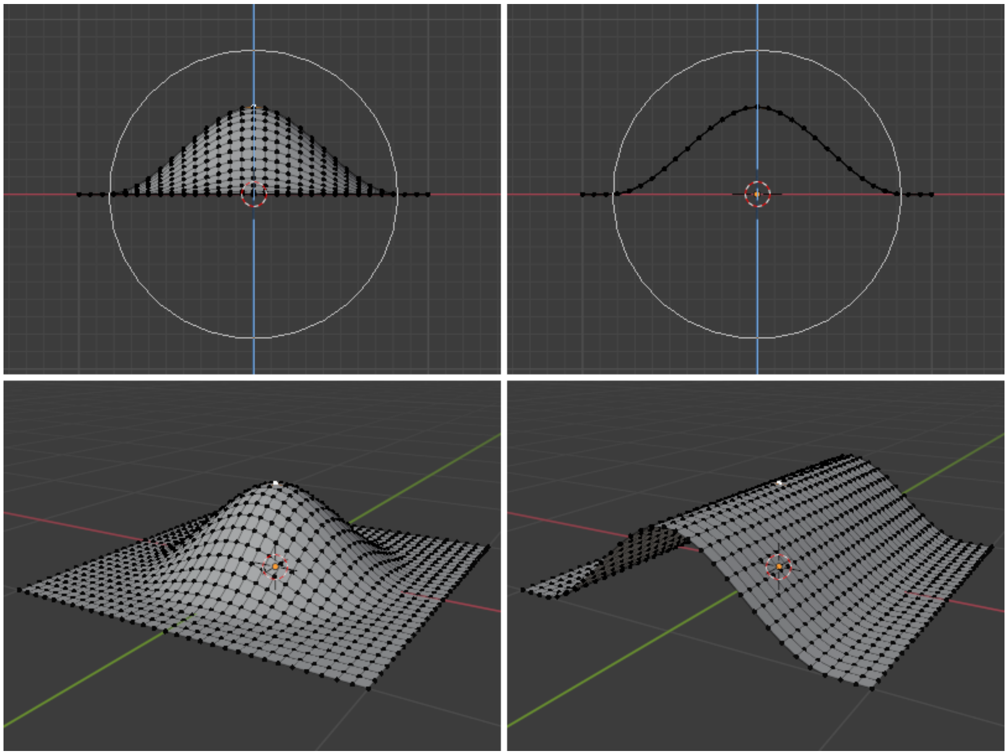
Options

Connected Only `Alt-O`

Rather than using a radius only, the proportional falloff spreads via connected geometry. This means that you can proportionally edit the vertices in a finger of a hand without affecting the other fingers. While the other vertices are physically close (in 3D space), they are far away following the topological edge connections of the mesh. The icon will have a blue center when *Connected* is active. This mode is only available in *Edit Mode*.

Projected from View

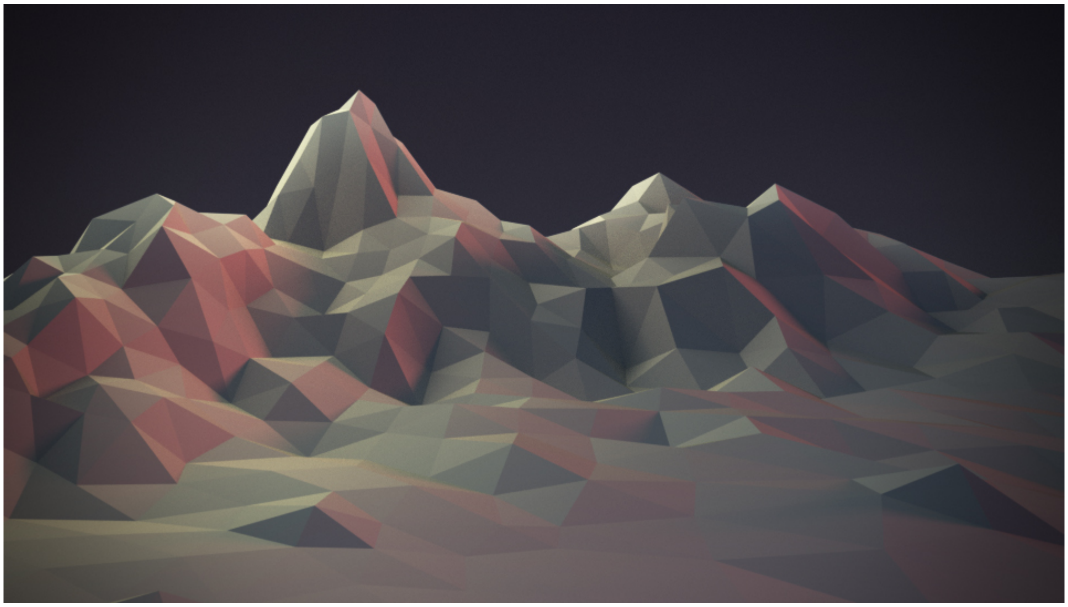
Depth along the view is ignored when applying the radius.



The difference between having "Projected from View" disabled (left) and enabled (right).

Example

The image below shows the final render of a low-poly landscape obtained by moving up the vertices of a triangulated grid with *Proportional Editing* enabled.



A landscape obtained via Proportional Editing.

Display

- Object Type Visibility
- Viewport Gizmos
    - Viewport Gizmos
    - Object Gizmos
    - Empty
    - Light
    - Camera
- Viewport Overlays
    - General
    - Mesh Edit Mode Overlays
    - Sculpt Mode Overlays
    - Vertex Paint Overlays
    - Weight Paint Overlays
    - Texture Paint Overlays
    - Pose Mode Overlays
    - Grease Pencil
- Viewport Shading
    - Wireframe
    - Solid
    - Material Preview
    - Rendered

Object Type Visibility

Reference

Mode:: All Modes
Header:: *View Object Types*

This popover lets you control the visibility and selectability of the various object types. For example, you can hide all the Lights in the scene with one click.

The settings only apply to the current 3D Viewport. Object types marked as unselectable can still be selected in other viewports and in the Outliner, for example.

See also

Outliner Restriction Columns for making individual objects invisible or unselectable across all viewports.

Viewport Gizmos

Reference

Mode:: All Modes

Header:: *Gizmos*

Clicking the icon toggles all gizmos in the 3D Viewport. The drop-down button displays a popover with more detailed settings, which are described below.

Viewport Gizmos

Navigate
    Enable/disable the navigation gizmo.

Active Tool
    Enable/disable the gizmo of the active tool.

Active Object
    Enable/disable the Object Gizmos for the active element (see below).

Object Gizmos

Object Gizmos allow mouse-controlled translation, rotation and scaling in the 3D Viewport. While they're called "object" gizmos in the popover, they also apply to other transformable elements such as mesh vertices.

There is a separate gizmo for each operation. Each gizmo can be used separately or in combination with the others.

A gizmo always has three color-coded axes: X (red), Y (green), and Z (blue). You can drag an axis with `LMB` to transform along it. The Move and Scale gizmos additionally have small colored squares for transforming along two axes in one go.

Various modifier keys can be used:

- Holding `Ctrl` at any time will toggle snapping and also make rotation and scaling work in coarse increments.
- Holding `Shift` *after* pressing `LMB` will do the opposite of the above, "slowing down" the transformation relative to mouse movement to allow finer adjustments.
- Holding `Shift` *before* pressing `LMB` will perform the transformation in the plane that's perpendicular to the clicked axis. See Plane Locking.

The Gizmos popover has the following settings for object gizmos:

Orientation
: The orientation to use for the gizmo. *Default* means to use the viewport's Transform Orientation. The other options override it.

Move
: Show the gizmo to control the location. Dragging the small white circle allows free movement in the viewing plane.

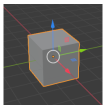
Rotate
: Show the gizmo to control the rotation. Dragging the large white circle allows rotation around the viewing direction. Dragging the translucent white disc within that circle (only visible when hovering over the gizmo) allows trackball rotation.

Scale
: Show the gizmo to control the scale. Dragging the area between the small and large white circles scales along all three axes.

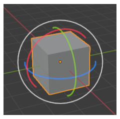
The latter three options are also available in a pie menu if you have the *Grave Accent / Tilde Action* in the Keymap Preferences set to *Gizmos*.

Note

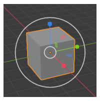
If you're using a tool that's tied to a particular gizmo setup (the *Move*, *Rotate*, *Scale* and *Transform* tools), the Move/Rotate/Scale checkboxes won't have any effect.



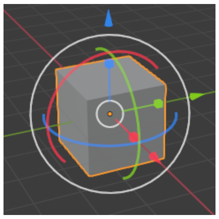
Move.



Rotate.



Scale.



Combination.

See also

The Gizmo Preferences.

Empty

Gizmo settings for empties.

Image
Show the gizmo to adjust the image size and position.

Force Field
Show the gizmo to adjust the force field.

Light

Gizmo settings for lights.

Size
Show the gizmo to adjust the Spot Size of spotlights.

Look At
Show the gizmo to adjust the direction of lights.

Camera

Gizmo settings for cameras.

Lens

Show the gizmo to adjust the focal length (for Perspective cameras) or orthographic scale (for Orthographic cameras).

Focus Distance

Enable the gizmo for adjusting the focus distance. To see this gizmo, you need to enable the *Viewport Display* ▸ *Limits* checkbox in the camera’s properties (green camera icon).

Viewport Overlays

Reference

Mode:: All Modes
Header:: *Overlays*

Clicking the icon toggles all overlays in the 3D Viewport.

Note

Cameras outline & passepartout are not considered Viewport overlays.

The drop-down button displays a popover with more detailed settings, which are described below.

Depending on the current object interaction mode, there may be a second button with yet more settings, which are also described here.

General

The following options are always present, independent of the current mode. Some of the overlays can be customized in the Viewport Preferences.

Guides

Grid
    Show grid in orthographic side view.

Floor
    Show the ground plane in perspective view.

Axes

Show the X, Y and/or Z axis lines.

Scale

The distance between lines in the grid/floor.

Subdivisions

The number of subdivisions between grid lines.

Text Info

Show various bits of information in the top left corner of the viewport.

- **View Perspective** – Name of the View Perspective, such as “Top Orthographic” or “User Perspective.”
- **Playback Frame Rate (FPS)** – Displays the Frames Per Second at which the animation is playing. By default, Blender goes through every single frame, which may result in an FPS that’s lower than intended (and the animation playing slower than realtime); the FPS turns red in this case. You can change this behavior in the Playback popover of the Timeline.
- **Object Info** – Shows the current frame in parentheses, followed by the names of the selected Collection and the active object. When applicable, also shows the selected Shape Key and (in angle brackets) the Marker on the current frame. If the object has a keyframe on the current frame, the Object Info is displayed in yellow.
- **Grid Resolution** – When the view is aligned to a world axis (see Viewpoint), the Text Info additionally shows the smallest distance between two parallel grid lines.

Statistics

Show information about the amount of objects and geometry. Note that the counters depend on the current selection. For example, selecting a mesh gives info on the number of vertices, edges, and faces, while selecting a light shows the number of lights in the scene.

- **Objects** – Number of the selected objects and the total count.
- **Geometry** – Displays information about the current scene depending on the mode and object type. This can be the number of vertices, faces, triangles, or bones.

Camera Guides

Show Camera guides (Safe Areas & Composition Guides), only available in camera view.

HDRI Preview

Show two spheres, one glossy and one diffuse, to preview the HDRI that's being used for world lighting. While HDRIs can be used in both the *Material Preview* and *Rendered* shading modes, the HDRI Preview overlay is only available in the former.

3D Cursor

Show the 3D Cursor.

Annotations

Show annotations.

Objects

Extras

Show objects that don't have geometry (such as empties, cameras and lights).

Light Colors

Shades the outline of light objects to the color the light produces.

Relationship Lines

Show dashed lines indicating parent or constraint relationships.

Outline Selected

Show an outline around selected objects.

Bones

Show Bones.

Motion Paths

Show the motion path overlay.

Origin

Show the origins of the selected objects.

Origin (All)
Show the origins of all objects.

Bone Wireframe Opacity
The maximum opacity used for bones drawn in the *Wireframe* shading mode (or in *Solid* shading mode with X-Ray active). This is helpful when it is necessary to reduce clutter and focus on the mesh rather than bones.

Geometry

Wireframe
Display mesh edges. Similar to Wireframe Shading, but displays edges on top of existing shading. The value slider adjusts which edges to display: lower values hide edges on surfaces that are almost flat, while a value of 1 shows all edges.

Opacity
The opacity of the displayed edges, from 0 (invisible) to 1 (fully opaque).

Fade Inactive Geometry
In modes other than Object Mode, fade out objects that you're not working on. The slider controls how much they're faded out.

Face Orientation
Show faces whose normal is pointing towards the camera in blue, and faces whose normal is pointing away from the camera in red. This lets you quickly check for faces that are oriented incorrectly: the outside surface of an object should typically be all blue.

Viewer Node

Visualizes Attributes connected to the Viewer Node.

Viewer Node

Visualize the value of the attribute connected to the *Viewer Node* as a greyscale color.

Color Opacity

Opacity of the attribute that is currently visualized.

Attribute Text

Show attribute values as text in viewport.

Motion Tracking

Show the motion tracking overlay.

Camera Path

Show the reconstructed camera path.

Marker Names

Show the names for reconstructed track objects.

Tracks

Change the display of the reconstructed tracks: plain axes, arrows and so on.

Size

Change the display size of the reconstructed tracks.

Mesh Edit Mode Overlays

The following options are available when in Mesh Edit Mode.

Faces

Highlight selected faces. Affects all selection modes.

Center

Show face center points in solid shading modes. (They’re always shown in wireframe shading mode.)

Only affects face selection mode.

Creases

Display edges marked with a crease for the Subdivision Surface Modifier.

Sharp

Display sharp edges, used with the Edge Split modifier.

Bevel

Display weights created for the Bevel Modifier.

Seams

Display the UV unwrapping seams.

Shading

Retopology

This overlay is useful when you have a sculpted mesh with the desired shape and want to recreate it with better topology. It makes the edited mesh see-through (so that you can see the sculpted mesh underneath it) and optionally renders it in front of nearby geometry (so that you can see it underneath the sculpted mesh).

Offset

Distance to “move the edited mesh towards the camera.” Use this to display the mesh in front of other objects that would normally occlude it.

Vertex Groups Weights

Visualize the weights of the active vertex group, much like in Weight Paint mode.

Zero Weights

Display unreferenced and zero-weighted areas in black. This helps to identify areas with very low weights that have been painted onto.

None:: Vertices are displayed in the usual way.

Active::	Vertices are shown in black if they have no weight in the active vertex group.
All::	Vertices are shown in black if they have no weight in any vertex group.

Mesh Analysis

Show the Mesh Analysis overlay.

Measurement

Show numerical measures of the selected elements. The Units can be set in the Scene properties.

Edge Length
  Show the length of selected edges.

Edge Angle
  Show the angle of selected edges between two faces.

Face Area
  Show the area of selected faces.

Face Angle
  Show the angle of selected face corners.

Tip

Geometry connected to the selection is shown while transforming, allowing you to move a vertex and see the connected edge lengths for example.

Note

These values respect the Transform Space in the Sidebar. Use *Global* if you want the object's scale to be applied to the measurements.

See also

The Measure tool for measuring arbitrary distances and angles.

Normals

- Display vertex normals
- Display face normals at vertices (split normals)
- Display face normals

Size
: The size to show the selected normals.

Constant Screen Size Normals
: Keep the size of normals constant in relation to the zoom level.

Developer

These overlays are only available if *Developer Extras* is enabled in the Interface Preferences.

Indices
: Display the indices of selected vertices, edges, and faces.

Freestyle

These settings apply to the Freestyle line art renderer.

Edge Marks
: Display Freestyle edge marks.

Face Marks

Display Freestyle face marks.

Sculpt Mode Overlays

Mask

Show Masks as overlays on an object. The opacity of the overlay can be adjusted.

Face Sets

Show Face Sets as overlays on an object. The opacity of the overlay can be adjusted.

Vertex Paint Overlays

Stencil Mask Opacity

Does nothing. (Stencil masks are only available for texture painting.)

Show Wire

Display mesh edges in white (unlike the *Wireframe* overlay which shows them in black).

Weight Paint Overlays

Opacity

The opacity of the overlay.

Zero Weights

Display unreferenced and zero-weighted areas in black. This helps to identify areas with very low weights that have been painted onto.

None::	Vertices are displayed in the usual way.
Active::	Vertices are shown in black if they have no weight in the active vertex group.
All::	Vertices are shown in black if they have no weight in any vertex group.

Show Weight Contours

Show contour lines formed by points with the same interpolated weight.

This visualizes weight variations too small to be seen from colors and can be useful for judging the smoothness and consistency of gradients, e.g. when using smoothing tools and brushes.

Show Wire

Display mesh edges in white (unlike the *Wireframe* overlay which shows them in black).

Texture Paint Overlays

Stencil Mask Opacity

Opacity of the stencil mask overlay.

Pose Mode Overlays

Fade Geometry

Show the bones on top and face other geometry to the back. The opacity can be controlled with the slider. Only available in Pose Mode.

Grease Pencil

These overlays are available when a Grease Pencil object is selected.

Onion Skin

Show ghosts of the keyframes before and after the current frame. If Multiframe is enabled, ghosts of the selected keyframes are shown instead. See Onion Skinning.

Fade Inactive Layers

Decrease the opacity of all the layers in the object other than the active one. The opacity factor can be controlled with the slider.

Fade Inactive Objects

Cover all of the viewport except the active Grease Pencil object with a full color layer to improve visibility while drawing over complex scenes.

Fade Grease Pencil Objects
Include or exclude Grease Pencil objects.

Edit Lines *Edit, Sculpt, Weight Paint, or Vertex Paint Modes* `Shift-Q`
Shows a line between points on top of other geometry when editing strokes.

Only in Multiframe `Shift-Alt-Q`
When Multiframe is enabled and keyframes other than the current frame are selected, strokes on those keyframes are displayed as just their edit lines – the strokes themselves are hidden. Note that this does not affect Onion Skinning.

Stroke Direction *Edit*
Toggle the display of the selected strokes' start points (green) and end points (red) to visualize their direction.

Material Name *Edit*
Show material name next to the selected strokes.

Vertex Paint

Vertex Paint Opacity *Vertex Paint*
The opacity of the vertex color overlay in Vertex Paint Mode and Draw Mode. Note that in Draw Mode, vertex paint is only visible in the *Material Preview* and *Rendered* shading modes by default. To see it in *Solid* mode, you either need to use Vertex Paint Mode, or set the Color shading setting to *Attribute*.

Canvas

Display a grid over the Grease Pencil drawing plane.

Canvas Grid Opacity

The opacity of the grid.

Canvas X-Ray
Objects are drawn behind the canvas grid.

Subdivisions
The number of subdivisions between grid lines.

Grid Color
The color of the grid lines.

Scale X/Y
The horizontal/vertical size of the grid.

Offset X/Y
The amount to shift the grid up/down and left/right.

Viewport Shading

Reference

Mode::	All Modes
Header::	*Viewport Shading*
Shortcut::	`Z` `Shift-Z`

Blender offers different shading modes for helping with different tasks. For example, Solid shading is well-suited for modeling, while Rendered is useful for setting up lighting.

The radio buttons let you change the shading mode, while the drop-down button opens a popover with additional options described below.

Pressing `Z` opens a pie menu for changing the shading mode. Pressing `Shift-Z` switches between the current shading mode and Wireframe.

Wire Color
: How wireframes are colored. This affects the Wireframe shading mode and overlay.

Theme::	Use the *Active Object*, *Wire*, or *Wire Edit* theme color based on the object's current state.
Object::	Use the color from the object's Viewport Display settings.
Random::	Each object gets displayed in a random color.

Wireframe

Only displays the edges (wireframes) of the objects in the scene.

Background
: How the background is displayed in the 3D Viewport.

Theme::	Use the background of the theme. This can be configured in the Themes Preferences under *3D Viewport ▸ Theme Space ▸ Gradient Colors*.
World::	Use the color from the World's Viewport Display options.
Viewport::	Select a custom color for the background of the 3D Viewport.

Options

X-Ray `Alt-Z`

Make objects transparent, allowing you to see and select items that would otherwise be occluded. The slider controls object opacity.

Outline

Draw an outline around objects. The color of the outline can be adjusted.

Solid

This mode utilizes the Workbench Render Engine to render the 3D Viewport. It shows solid geometry but uses simplified shading and lighting without the use of shader nodes. Solid mode is good for modeling and sculpting, and is really useful with the multitude of options to emphasize certain geometric features.

Lighting

How lights are computed.

Flat::	Do not calculate any lighting. The base color of the scene will be rendered.
Studio::	Use studio lights to light the objects. The studio lights can be configured in the preferences. Studio lights can follow the camera or be fixed. When fixed the angle of the lights can be adjusted. World Space Lighting

	Uses world space lighting so lights do not follow the view camera. Rotation The rotation of the studio lights on the Z axis.
MatCap::	Use a material capture to light the objects in the scene. MatCaps can be flipped horizontally by clicking the Flip MatCap button. Custom MatCaps can be loaded in the preferences.

Color

The source to compute the color for objects in the viewport.

Material::	Use the color that can be set per material in the Viewport Display Material panel.
Object::	Use the color that can be set per object in the Viewport Display Object panel.
Attribute::	Display the active Color Attribute of an object. When an object has no active Color Attribute it will be rendered in the color set in the Viewport Display Object panel.
Single::	Render the whole scene using a single color. The color can be chosen.
Random::	A random color will be selected for every object in the scene.
Texture::	Show the texture from the active image texture node using the active UV map coordinates When an object has no active texture the object will be rendered with the settings in the Viewport Display Material panel.

Background

How the background is displayed in the 3D Viewport.

Theme::	Use the background of the theme. This can be configured in the Themes Preferences under *3D Viewport ▸ Theme Space ▸ Gradient Colors*.

World::	Use the color from the World’s Viewport Display options.
Viewport::	Select a custom color for the background of the 3D Viewport.

Options

Backface Culling

Use backface culling to hide backsides of faces.

X-Ray

Render the scene transparent. With the slider you can control how transparent the scene should appear.

Shadow

Renders a sharp shadow in the scene.

Darkness

Defines how dark the shadow should be rendered. This slider can be adjusted between 0 (shadow not visible) and 1 (shadow is black).

Light Direction

Controls the direction of the light source that casts the shadows.

Shadow Shift

Controls the Shadow termination angle. It can be used to limit self shadowing artifacts.

Shadow Focus

Controls the falloff near the edge of the shadow.

Cavity

Highlight ridges and valleys in the scene geometry.

Type

Method how to calculate the cavity.

World::	More precise but is slower to calculate.

Screen::	Fast but does not take the size of the ridges and valleys into account.
Both::	Both will use both methods.

Ridge

Control the visibility of ridges.

Valley

Control the visibility of valleys.

Depth of Field

Use the Depth of Field settings of the active camera in the viewport. Only visible when looking through the camera.

The settings are located on *Properties* ▸ *Camera* ▸ *Depth of Field* panel.

Outline

Render the outline of objects in the viewport. The color of the outline can be adjusted.

Specular Highlighting

Render specular highlights.

Note

Only available when Lighting is set to *Studio* lighting or when a MatCap has been selected that contains a specular pass.

Material Preview

Render the 3D Viewport with EEVEE and an HDRI environment. This mode is particularly suited for previewing materials and painting textures. You can select different lighting conditions to test your materials.

Note

The Material Preview shading mode is not available when the scene's render engine is set to Workbench.

Lighting

Scene Lights

Use the lights in the scene. When disabled (or when the scene contains no lights), a virtual light is used instead.

Scene World

Use the World of the scene. When disabled, a world will be constructed with the following options:

HDRI Environment

The environment map used to light the scene.

Rotation

The rotation of the environment on the Z axis.

World Space Lighting

Makes the lighting rotation fixed and not follow the camera.

Strength

Light intensity of the environment.

World Opacity

Opacity of the HDRI as a background image in the viewport.

Blur

Factor to unfocus the HDRI. Note that this does not change the diffusion of the lighting, only the appearance of the background.

Render Pass

Instead of the combined render, show a specific render pass. Useful to analyze and debug geometry, materials and lighting.

Compositor

Controls the enablement of the compositor in the viewport. If enabled, the scene compositor node tree will be evaluated using the GPU Compositor and the output will be displayed directly in the viewport.

Disabled::	Always disabled.
Camera::	Enabled only in camera view.
Always::	Always enabled regardless of the view.

Tip

Since it might be difficult to control the look of the viewport compositor due to changes in the aspect ratio, pan, and zoom of the viewport, one can limit the compositing space to the camera region by changing to Camera View, which should make the results better match the final render.

Rendered

Render the 3D Viewport using the scene's *Render Engine*, for interactive rendering. This gives you a preview of the final result, including scene lighting effects.

The options are the same as for *Material Preview*, except that the *Render Pass* selector will offer different passes if the scene uses the Cycles render engine.

Toolbar

The Toolbar contains a list of tools. Links to each mode's Toolbar are listed below.

Object Mode

- Object Mode

Edit Mode

- Mesh Edit Mode
- Curve Edit Mode
- Surface Edit Mode
- Metaball Edit Mode

Paint Modes

- Sculpt Mode
- Texture Paint Mode
- Vertex Paint Mode
- Weight Paint Mode

Grease Pencil

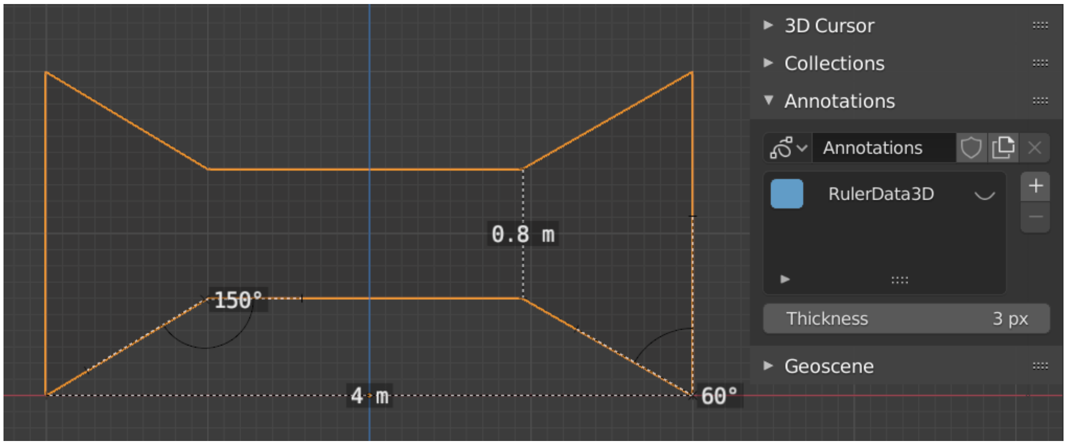
- Grease Pencil Edit
- Grease Pencil Draw
- Grease Pencil Sculpting
- Grease Pencil Weight Paint

Measure

Reference

Mode::	All Modes
Tool::	*Toolbar* ‣ *Measure*

The *Measure* tool is an interactive tool where you can drag lines in the scene to measure distances or angles. Snapping to geometry could be activated for better accuracy or to measure wall thickness. The *Measure* tool can be accessed from the Toolbar.


0.8 m
150°
4 m
60°
3D Cursor
Collections
Annotations
Annotations
RulerData3D
Geoscene

Thickness 3 px

Examples of the Measure tool.

Usage

Here are some common steps for using the *Measure* tool:

1. Activate the *Measure* tool from the Toolbar.
2. Click and drag in the viewport to define the initial start and end point for the ruler. You can add multiple rulers in the viewport.
3. Drag either end of the ruler to move it.

   - Holding `Ctrl` while moving enables snapping to edges and vertices.
   - Holding `Shift` while moving lets you measure the distance between faces. This only works well with parallel faces, e.g. walls.

   You can always navigate (pan, zoom, …) or change the view (orthogonal, perspective) in the viewport to have better access to the ruler.

4. Click on the midpoint of a created ruler to convert it to a protractor. The midpoint can then be dragged just like the endpoints.

5. A selected ruler can be deleted with `Delete` or `X`. To delete all measurements, delete the "RulerData3D" layer in the *Sidebar* ▸ *View* ▸ *Annotations* panel (see image above).

All measurements are hidden when another tool is selected. They are shown when the *Measure* tool is selected again. However, you can do editing operations while the ruler is active. For example, you can edit the rotation or scale of the selected object in the Sidebar.

Measurements do not appear in the Render output.

Unit settings and scale from the scene are used for displaying dimensions. Changing the unit system (metric, imperial), or the units of length (cm, m, …) or angle (degrees, radians) will update the measurements.

Tip

In Edit Mode only, there is also a *Measurement* group in the Viewport Overlays popover. Using the settings in this group, you can have the viewport automatically display measurements for selected edges and faces, without the need to manually create a ruler.

Add Cube

Reference

Mode::	Object Mode and Edit Mode
Tool::	*Toolbar* ‣ *Add Cube*

Interactively add a cube mesh object.

Usage

First define the base of the object by dragging with `LMB`. Next, release `LMB` and move the mouse to define the height of the object. Finally, click `LMB` to confirm the shape of the object.

You can use the following hotkeys to temporarily change a setting (for as long as the key is held):

`Ctrl`	Toggles snapping.
`Alt`	Toggles the *Origin* setting.
`Shift`	Toggles the *Aspect* setting.

Tool Settings

Depth
: The initial depth (from the screen into the scene) used when placing the object.

Surface::	Start placing on the surface under the mouse cursor. If there is no surface, this does the same as *Cursor Plane*.
Cursor Plane::	Start placing on a plane that goes through the 3D Cursor and is aligned according to the *Orientation* and *Plane Axis*.
Cursor View::	Start placing on a plane that goes through the 3D Cursor and is aligned to the view.

Orientation

The new object's orientation – a set of three axes, out of which *Plane Axis* chooses one.

Surface::	The object uses the normal orientation of the surface under the mouse cursor. If there is no surface, this does the same as *Default*.
Default::	The object uses the default Transform Orientation.

Snap To

The target to use while Snapping.

Geometry::	Snap to all types of geometry (vertices, edges, and faces).
Default::	Snap to the target defined in the global snapping options.

Plane Axis

Which of the three *Orientation* axes (X, Y or Z) is "up" for the object. The object's base will be perpendicular to this axis.

Auto Axis

Rather than using the *Orientation* axis indicated by *Plane Axis*, use the one that's closest to the viewport's viewing direction (when not hovering over a surface).

Base

Origin

How the base is defined.

Edge::	The base is defined from one corner to the opposing corner.
Center::	The base is defined from the centerpoint to a corner.

Aspect
Whether the base has a free or fixed aspect ratio.

Free::	The width and depth of the base can be chosen independently.
Fixed::	The width and depth of the base are forced to be equal.

Height

Origin
How the height is defined.

Edge::	The base becomes the bottom, after which you define the top.
Center::	The base becomes the center, after which you define the top.

Aspect
Whether the object's side has a free or fixed aspect ratio.

Free::	The height can be chosen independently of the base.
Fixed::	The height is forced to be equal to the largest side of the base.

Add Cone

Reference

Mode:: Object Mode and Edit Mode
Tool:: *Toolbar ‣ Add Cone*

Interactively add a cone mesh object.

Usage

First define the base of the object by dragging with `LMB`. Next, release `LMB` and move the mouse to define the height of the object. Finally, click `LMB` to confirm the shape of the object.

You can use the following hotkeys to temporarily change a setting (for as long as the key is held):

`Ctrl`	Toggles snapping.
`Alt`	Toggles the *Origin* setting.
`Shift`	Toggles the *Aspect* setting.

Tool Settings

Depth
  The initial depth (from the screen into the scene) used when placing the object.

Surface::	Start placing on the surface under the mouse cursor. If there is no surface, this does the same as *Cursor Plane*.
Cursor Plane::	Start placing on a plane that goes through the 3D Cursor and is aligned according to the *Orientation* and *Plane Axis*.
Cursor View::	Start placing on a plane that goes through the 3D Cursor and is aligned to the view.

Orientation

The new object's orientation – a set of three axes, out of which *Plane Axis* chooses one.

Surface::	The object uses the normal orientation of the surface under the mouse cursor. If there is no surface, this does the same as *Default*.
Default::	The object uses the default Transform Orientation.

Snap To

The target to use while Snapping.

Geometry::	Snap to all types of geometry (vertices, edges, and faces).
Default::	Snap to the target defined in the global snapping options.

Plane Axis

Which of the three *Orientation* axes (X, Y or Z) is "up" for the object. The object's base will be perpendicular to this axis.

Auto Axis

Rather than using the *Orientation* axis indicated by *Plane Axis*, use the one that's closest to the viewport's viewing direction (when not hovering over a surface).

Base

Origin

How the base is defined.

Edge::	The base is defined from one corner to the opposing corner.
Center::	The base is defined from the centerpoint to a corner.

Aspect

Whether the base has a free or fixed aspect ratio.

Free::	The width and depth of the base can be chosen independently.
Fixed::	The width and depth of the base are forced to be equal.

Height

Origin

How the height is defined.

Edge::	The base becomes the bottom, after which you define the top.
Center::	The base becomes the center, after which you define the top.

Aspect

Whether the side of the bounding box has a free or fixed aspect ratio.

Free::	The height can be chosen independently of the base.
Fixed::	The height is forced to be equal to the largest side of the base.

Vertices

The number of vertices in the base.

Base Fill Type

Set how the circle at the base will be filled.

Triangle Fan::	Fill with triangular faces which share a vertex in the middle.
N-gon::	Fill with a single N-gon.
Nothing::	Do not fill. Creates only the outer ring of vertices.

Add Cylinder

Reference

Mode:: Object Mode and Edit Mode
Tool:: *Toolbar* ‣ *Add Cylinder*

Interactively add a cylinder mesh object.

Usage

First define the base of the object by dragging with `LMB`. Next, release `LMB` and move the mouse to define the height of the object. Finally, click `LMB` to confirm the shape of the object.

You can use the following hotkeys to temporarily change a setting (for as long as the key is held):

`Ctrl`	Toggles snapping.
`Alt`	Toggles the *Origin* setting.
`Shift`	Toggles the *Aspect* setting.

Tool Settings

Depth
: The initial depth (from the screen into the scene) used when placing the object.

Surface::	Start placing on the surface under the mouse cursor. If there is no surface, this does the same as *Cursor Plane*.
Cursor Plane::	Start placing on a plane that goes through the 3D Cursor and is aligned according to the *Orientation* and *Plane Axis*.
Cursor View::	Start placing on a plane that goes through the 3D Cursor and is aligned to the view.

Orientation

The new object's orientation – a set of three axes, out of which *Plane Axis* chooses one.

Surface::	The object uses the normal orientation of the surface under the mouse cursor. If there is no surface, this does the same as *Default*.
Default::	The object uses the default Transform Orientation.

Snap To

The target to use while Snapping.

Geometry::	Snap to all types of geometry (vertices, edges, and faces).
Default::	Snap to the target defined in the global snapping options.

Plane Axis

Which of the three *Orientation* axes (X, Y or Z) is "up" for the object. The object's base will be perpendicular to this axis.

Auto Axis

Rather than using the *Orientation* axis indicated by *Plane Axis*, use the one that's closest to the viewport's viewing direction (when not hovering over a surface).

Base

Origin

How the base is defined.

Edge::	The base is defined from one corner to the opposing corner.
Center::	The base is defined from the centerpoint to a corner.

Aspect

Whether the base has a free or fixed aspect ratio.

Free::	The width and depth of the base can be chosen independently.
Fixed::	The width and depth of the base are forced to be equal.

Height

Origin

How the height is defined.

Edge::	The base becomes the bottom, after which you define the top.
Center::	The base becomes the center, after which you define the top.

Aspect

Whether the side of the bounding box has a free or fixed aspect ratio.

Free::	The height can be chosen independently of the base.
Fixed::	The height is forced to be equal to the largest side of the base.

Vertices

The number of vertices in the caps.

Cap Fill Type

Set how the caps will be filled.

Triangle Fan::	Fill with triangular faces which share a vertex in the middle.
N-gon::	Fill each ring with an N-gon.
Nothing::	Do not fill. Creates only the outer rings of vertices.

Add UV Sphere

Reference

Mode:: Object Mode and Edit Mode
Tool:: *Toolbar* ▸ *Add UV Sphere*

Interactively add a UV sphere mesh object.

Usage

First define the base of the object by dragging with `LMB`. Next, release `LMB` and move the mouse to define the height of the object. Finally, click `LMB` to confirm the shape of the object.

You can use the following hotkeys to temporarily change a setting (for as long as the key is held):

`Ctrl`	Toggles snapping.
`Alt`	Toggles the *Origin* setting.
`Shift`	Toggles the *Aspect* setting.

Tool Settings

Depth
    The initial depth (from the screen into the scene) used when placing the object.

Surface::	Start placing on the surface under the mouse cursor. If there is no surface, this does the same as *Cursor Plane*.
Cursor Plane::	Start placing on a plane that goes through the 3D Cursor and is aligned according to the *Orientation* and *Plane Axis*.
Cursor View::	Start placing on a plane that goes through the 3D Cursor and is aligned to the view.

Orientation

The new object's orientation – a set of three axes, out of which *Plane Axis* chooses one.

Surface::	The object uses the normal orientation of the surface under the mouse cursor. If there is no surface, this does the same as *Default*.
Default::	The object uses the default Transform Orientation.

Snap To

The target to use while Snapping.

Geometry::	Snap to all types of geometry (vertices, edges, and faces).
Default::	Snap to the target defined in the global snapping options.

Plane Axis

Which of the three *Orientation* axes (X, Y or Z) is "up" for the object. The object's base will be perpendicular to this axis.

Auto Axis

Rather than using the *Orientation* axis indicated by *Plane Axis*, use the one that's closest to the viewport's viewing direction (when not hovering over a surface).

Base

Origin

How the base is defined.

Edge::	The base is defined from one corner to the opposing corner.
Center::	The base is defined from the centerpoint to a corner.

Aspect

Whether the base has a free or fixed aspect ratio.

Free::	The width and depth of the base can be chosen independently.
Fixed::	The width and depth of the base are forced to be equal.

Height

Origin

How the height is defined.

Edge::	The base becomes the bottom, after which you define the top.
Center::	The base becomes the center, after which you define the top.

Aspect

Whether the side of the bounding box has a free or fixed aspect ratio.

Free::	The height can be chosen independently of the base.
Fixed::	The height is forced to be equal to the largest side of the base.

Segments

Number of vertical segments. Like the Earth's meridians, going pole to pole.

Rings

Number of horizontal segments. These are like the Earth's parallels.

Note

Rings are face loops and not edge loops, which would be one less.

Add Icosphere

Reference

Mode::	Object Mode and Edit Mode
Tool::	*Toolbar ▸ Add Icosphere*

Interactively add an Icosphere mesh object.

Usage

First define the base of the object by dragging with `LMB`. Next, release `LMB` and move the mouse to define the height of the object. Finally, click `LMB` to confirm the shape of the object.

You can use the following hotkeys to temporarily change a setting (for as long as the key is held):

`Ctrl`	Toggles snapping.
`Alt`	Toggles the *Origin* setting.
`Shift`	Toggles the *Aspect* setting.

Tool Settings

Depth
: The initial depth (from the screen into the scene) used when placing the object.

Surface::	Start placing on the surface under the mouse cursor. If there is no surface, this does the same as *Cursor Plane*.
Cursor Plane::	Start placing on a plane that goes through the 3D Cursor and is aligned according to the *Orientation* and *Plane Axis*.
Cursor View::	Start placing on a plane that goes through the 3D Cursor and is aligned to the view.

Orientation

The new object's orientation – a set of three axes, out of which *Plane Axis* chooses one.

Surface::	The object uses the normal orientation of the surface under the mouse cursor. If there is no surface, this does the same as *Default*.
Default::	The object uses the default Transform Orientation.

Snap To

The target to use while Snapping.

Geometry::	Snap to all types of geometry (vertices, edges, and faces).
Default::	Snap to the target defined in the global snapping options.

Plane Axis

Which of the three *Orientation* axes (X, Y or Z) is "up" for the object. The object's base will be perpendicular to this axis.

Auto Axis

Rather than using the *Orientation* axis indicated by *Plane Axis*, use the one that's closest to the viewport's viewing direction (when not hovering over a surface).

Base

Origin

How the base is defined.

Edge::	The base is defined from one corner to the opposing corner.
Center::	The base is defined from the centerpoint to a corner.

Aspect

Whether the base has a free or fixed aspect ratio.

Free::	The width and depth of the base can be chosen independently.
Fixed::	The width and depth of the base are forced to be equal.

Height

Origin

How the height is defined.

Edge::	The base becomes the bottom, after which you define the top.
Center::	The base becomes the center, after which you define the top.

Aspect

Whether the side of the bounding box has a free or fixed aspect ratio.

Free::	The height can be chosen independently of the base.
Fixed::	The height is forced to be equal to the largest side of the base.

Subdivisions

Influences how many vertices are used to define the sphere. At level 1 the icosphere is an icosahedron, a solid with 20 equilateral triangular faces. Each increase in the number of subdivisions splits each triangular face into four.

Note

Subdividing an icosphere raises the vertex count very quickly even with few iterations (10 times creates 5,242,880 triangles). Adding such a dense mesh is a sure way to cause the program to crash.

Sidebar

Item

Shows Transform settings of the active object.

Tool

Shows settings of the active tool and Workspace.

View

View Panel

The *View* panel lets you change other settings regarding the 3D Viewport.

Focal Length
Control the focal length of the 3D Viewport camera.

Clip Start/End
Adjust the minimum and maximum distances for geometry to be visible. Geometry closer than *Start* or further away than *End* will not be shown.

Note

In Orthographic view, the viewport uses negative *End* instead of *Start*.

Warning

A large clipping range will allow you to see both near and far objects, but reduces the depth precision resulting in artifacts.

In some cases, a very large range may cause operations that depend on the depth buffer to become unreliable, although this depends on the graphics card and drivers.

See Troubleshooting Depth Buffer Glitches for more information.

Local Camera

Allow this 3D Viewport to have its own active camera, separate from the global active camera that's defined in the scene. The selector next to the checkbox lets you choose this camera.

Passepartout

Show camera passepartout when in camera view.

Render Region

Use the Render Region. Defining the region with `Ctrl-B` will automatically enable this option.

Note that if you're viewing the scene through the active camera, this option has no effect – in this case, you instead need to use the checkbox *Output Properties* ▸ *Format* ▸ *Render Region* in the Properties editor. This will affect not just the viewport, but also the final render.

View Lock

Lock to Object

Lets you select an object to become the point of interest of the viewpoint. The view will then orbit around, and zoom towards, that object. This option is not available when viewing the scene through the active camera.

Lock: To 3D Cursor

Makes the 3D Cursor the point of interest of the viewpoint. This option is only available when *Lock to Object* is not active.

Lock: Camera to View

When looking through a camera, the camera becomes "glued" to the view and will follow it around as you navigate. The camera frame will be outlined with a red dashed line.

Hint

If the camera is parented to an object, you can choose to enable Camera Parent Lock in the camera’s properties. This will cause viewport navigation to transform the camera’s root parent rather than the camera itself.

3D Cursor

Location
: The location of the 3D Cursor.

Rotation
: The rotation of the 3D Cursor.

Rotation Mode
: The rotation mode of the 3D Cursor.

Collections

The *Collections* panel shows a list of collections and can be used to control their visibility. If a collection contains objects, there is a circle to the left of its name.

Local Collections
: Allows setting collection visibility per viewport rather than globally.

Hide in Viewport (eye icon)
: Shows or hides the collection.

You can also “isolate” a collection by clicking its name. This will show the collection as well as its ancestors and descendants, and hide all other collections.

Annotations

See Annotations for more information.

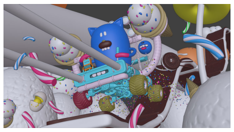
Viewport Render

Viewport rendering lets you create quick preview renders from the current viewpoint (rather than from the active camera, as would be the case with a regular render).

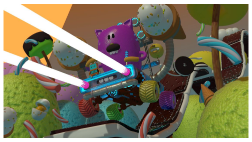
You can use *Viewport Render* to render both images and animations.

Below is a comparison between the Viewport render and a final render using the Cycles Renderer.

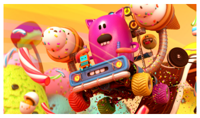
Model by © 2016 pokedstudio.com



Viewport render using Solid Mode.



Viewport render using Material Preview Mode.



Full render.

Note

Viewport rendering only works for the Workbench and EEVEE render engines. It's not supported for Cycles.

Tip

Disable overlays to get a render without "clutter" like rigs, empties and so on.

Settings

For the most part, *Viewport Render* uses the current viewport settings. Some settings are located in the properties of the render engine that is used to render the view.

Solid mode uses the render settings of Workbench; Material Preview mode uses the render settings of EEVEE.

Additionally, some output settings are used too:

- Resolution
- Aspect
- Output path
- File format

Rendering

Activating *Viewport Render* will render from the current active view. This means that if you are not in an active camera view, a virtual camera is used to match the current perspective. To get an image from the camera point of view, enter the active camera view with `Numpad0`.

As with a normal render, you can abort it with `Esc`.

Render a Still Image

To render a still image, use *3D Viewport ‣ View ‣ Viewport Render Image*.

Render an Animation

To render an animation, use *3D Viewport ‣ View ‣ Viewport Render Animation*.

Render Keyframes

To render an animation, but only those frames that have a keyframe, use *3D Viewport ‣ View ‣ Viewport Render Keyframes*. This only renders those frames for which the selected objects have an animation key. The other frames are still written to the output, but will simply repeat the last-rendered frame.

For example, when a six-frame animation is rendered, and the selected objects have a key on frames 3 and 5, the following frames will be output:

1. The 1st frame is always rendered.
2. The 1st frame is repeated because there is no key on this frame.
3. The 3rd frame is rendered.
4. The 3rd frame is repeated because there is no key on this frame.
5. The 5th frame is rendered.
6. The 5th frame is repeated because there is no key on this frame.

Tip

You can limit the viewport render to a particular region with Render Regions.

Image Editor

- Introduction
    - Toolbar
    - Header
    - Asset Shelf Region
    - Main View
- Navigating
    - Gizmos
    - View Menu
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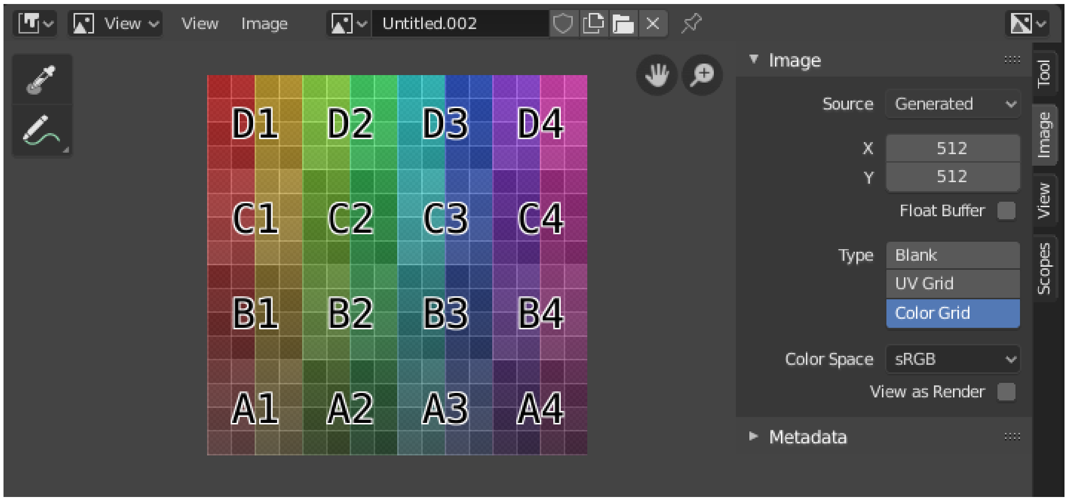
    - Save As
    - Save a Copy
    - Save All Images
    - Invert
    - Resize

    - Transform
    - Pack
    - Unpack
    - Extract Palette
    - Generate Grease Pencil

Introduction

The Image Editor lets you create, view, and edit images, as well as see render results and intermediate Compositor output.


View
View
Image
Untitled.002
D1
D2
D3
D4
C1
C2
C3
C4
B1
B2
B3
B4
A1
A2
A3
A4
Image
Type
Blank
UV Grid
Color Grid
Metadata
Tool
Image
View
Scopes

Source: Generated
X: 512
Y: 512
Float Buffer ☐
Type: Color Grid
Color Space: sRGB
View as Render ☐

Image Editor with a test grid texture.

Toolbar

Sample

Used to sample the color of one or more pixels in the image. As long as you hold `LMB`, the footer will show the following:

- X and Y coordinates of the mouse cursor.
- Color in RGBA.
- Color in RGB after Color Management.
- Color in HSV.
- Luminance.

Sample Size

The dimensions of the square used to sample underlying pixels. If larger than 1, the resulting sample is an average of all underlying pixels.

Annotate

See Annotations for more information.

Header

Mode

View::	Displays images.
Paint::	Texture Paint.
Mask::	Masking.

View

Tools for controlling how the content is displayed in the editor. See Navigating.

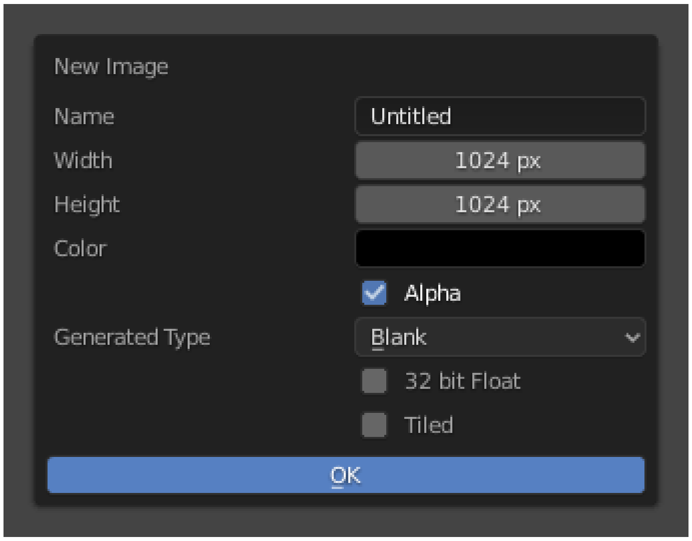
Image

Tools for opening and manipulating images. Shows an asterisk if the image has unsaved changes. See Editing.

Image

A data-block menu used for selecting images. Once an image is selected, the Image tab appears in the Sidebar region.

Apart from loading existing images, you can also create new ones:



Name: Untitled
Width: 1024 px
Height: 1024 px
Color: ■
☑ Alpha
Generated Type: Blank
☐ 32 bit Float
☐ Tiled

> The pop-over that's displayed when clicking "New Image" in the header.

The *Tiled* option creates an image with support for UDIMs. For the other options, see Generated Images.

In addition to images, the data-block selector includes the following items:

- Render Result: displays renders. When this item is selected, the *Slot*, *View Layer*, and *Render Pass* selectors become available (see below).
- Viewer Node: displays the image that's fed into the Viewer Node in the Compositor.

Image Pin

Prevents the Image Editor from automatically switching to the texture of the selected object. (This switching only happens if the 3D Viewport is in Texture Paint mode).

Slot

The render slot to view (and render to). You can create new renders without losing previous ones by selecting an empty slot before rendering. Afterwards, you compare them by pressing `J` and `Alt-J` to cycle forwards and backwards. Alternatively, you can use the number keys `1`, `2`, `3` etc. to select the slot with the corresponding number.

Slots can be renamed by double clicking their name in the Image panel in the Sidebar.

View Layer

The View Layer to display.

Render Pass

The Render Pass to display.

Viewport Gizmos

Lets you show/hide all gizmos using the toggle button, or specific gizmos using the drop-down arrow.

Navigate
Enable/disable the gizmos used to pan or zoom the 2D viewport. See Navigation Gizmos for more information.

Display Channels
Select which color channels are displayed.

Color & Alpha::	Enables transparency and shows a checkerboard behind the image.
Color::	Disables transparency.
Alpha::	Displays the alpha channel as a grayscale image. White areas are opaque, black areas are transparent.
Z-Buffer::	Displays the depth from the camera, from Clip Start to Clip End, as specified in the Camera settings.
Red, Green, Blue::	Single color channel visualized as a grayscale image.

Asset Shelf Region

Depending on the current mode, the asset shelf may be available, providing quick access to assets for this specific mode (for example brush assets in *Paint* mode).

See Asset Shelf for more information.

Main View

Holding `RMB` will sample the image just like the Sample tool, except it will always sample only one pixel.

Navigating

Panning can be done by dragging with `MMB`.

Zooming can be done using `Wheel` or `NumpadPlus`/`NumpadMinus`.

Gizmos

Next to the Sidebar region at the top, there are gizmos that allow panning and zooming more comfortably when e.g. no mouse wheel is available.

View Menu

Toolbar `T`

Show or hide the Toolbar.

Sidebar `N`

Show or hide the Sidebar.

Tool Settings

Show or hide the settings for the currently selected tool.

Asset Shelf

Toggle the visibility of the Asset Shelf.

Adjust Last Operation

Displays a pop-up panel to alter properties of the last completed operation. See Adjust Last Operation.

Update Automatically

Instantly update any other editors that are affected by changes in this Image Editor. When disabled, the other editors may display outdated information until they're manually refreshed (e.g. by orbiting for the 3D Viewport).

Show Metadata

Displays metadata about the selected Render Result. See the Output tab's Metadata panel to change what metadata to include.

Display Texture Paint UVs

Toggles UVs in Paint Mode. The object must be in Texture Paint Mode or Edit Mode for the UVs to be visible.

Zoom

Menu with convenient zoom levels and operations. The zoom levels are calculated based on the images resolution compared to the screen resolution.

- 12.5% (1:8) `Numpad8` zoom out to a factor of 12.5%.
- 25% (1:4) `Numpad4` zoom out to a factor of 25%.
- 50% (1:2) `Numpad2` zoom out to a factor of 50%.
- 100% (1:1) `Numpad1` resets the zoom to 100%.
- 200% (2:1) `Ctrl-Numpad2` zoom in to a factor of 200%.
- 400% (4:1) `Ctrl-Numpad4` zoom in to a factor of 400%.
- 800% (8:1) `Ctrl-Numpad8` zoom in to a factor of 800%.

Zoom In/Out `Wheel`

Zooms the view in or out.

Zoom to Fit `Shift-Home`

Like *Frame All*, but uses as much space in the editor as possible.

Zoom Region `Shift-B`

Zoom in the view to the nearest item contained in the border.

Frame All `Home`

Pans and zooms the view so that the image is centered and fully visible.

Center View to Cursor

Pan the view so that the 2D cursor is at the center of the editor.

Render Region `Ctrl-B`

Only available when viewing the Render Result. See Render Region.

Clear Render Region `Ctrl-Alt-B`

Only available when viewing the Render Result. See Render Region.

Render Slot Cycle Next/Previous `J`/`Alt-J`

Switch to the next/previous render slot (that contains a render).

Area

Adjust the area the Image Editor is in.

Sidebar

Tool

Displays the settings of the active tool.

Image

Image

Tools for working with images. See Image Settings.

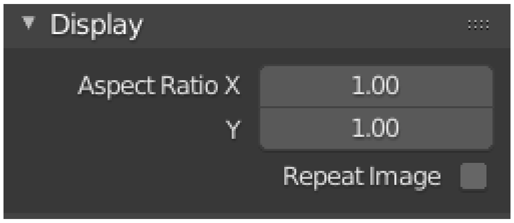
Metadata

Lists image metadata.

View

Display

You can set the editor's display options in this panel.



Aspect Ratio X 1.00

Y 1.00

Repeat Image ☐

Display panel.

Aspect Ratio
: Display aspect for this image. Does not affect rendering.

Repeat Image
: Tile the image so it completely fills the editor.

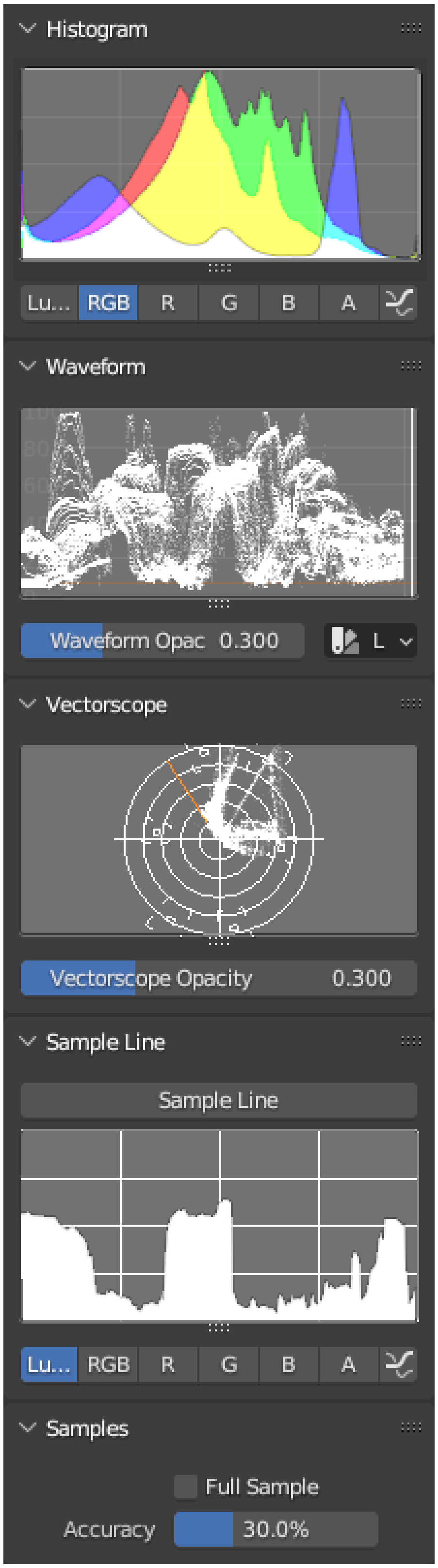
Annotations

Options for the annotation tool. See Annotations.

Scopes

Displays different kinds of statistical information about the colors in the image.

Note that the Scopes tab is not shown if the active object is in Edit Mode or Texture Paint Mode.


Histogram
Lu… RGB R G B A
Waveform
L
Vectorscope
Sample Line
Sample Line
Lu… RGB R G B A
Samples

Waveform Opac 0.300

Vectorscope Opacity 0.300

☐ Full Sample

Accuracy 30.0%

Scopes in the Image Editor.

Histogram

Displays a graph of the color distribution in the image. For each color value (such as Luminance) on the X axis, it shows the number of pixels with that value on the Y axis. A predominantly dark image would have the highest values toward the left side of the graph.

Use this mode to balance out the tonal range in an image. A well-balanced image should have a nice smooth distribution of color values.

You can drag `LMB` in the histogram to adjust its vertical zoom.

Luma
    Shows a luminosity histogram.

RGB
    Shows the RGB channels stacked on top of each other.

R/G/B/A
    Shows a single color channel.

Show Line
    Displays lines rather than filled shapes.

Waveform

Plots the color distribution for each vertical line of pixels in the image. The X axis of the Waveform corresponds to the X axis of the image, while the Y axis represents the range of a color component such as Luminance. The brighter a specific point is, the more pixels in that vertical line have that color value.

Waveform Opacity
    Opacity of the points.

Waveform Mode
    Luma
        Show a single Waveform plotting the luminosity distribution.

YCbCr
Show the Y, Cb and Cr Waveforms side by side.

Parade
Show the R, G and B Waveforms side by side.

Red Green Blue
Show the R, G and B Waveforms overlaid on top of each other.

Vectorscope

Shows the color distribution in a radial fashion. The angle represents the hue, while the distance from the center represents the saturation.

Vectorscope Opacity
Opacity of the points.

Sample Line

The *Sample Line* scope is the same as the Histogram but allows you to get the sample data from a line.

Sample Line
Used to draw a line to read the sample data from.

Samples

Full Sample
Sample every pixel.

Accuracy
Proportion of image pixels to sample if *Full Sample* is disabled.

Overlays

The Overlays pop-over configures the overlays that are displayed on top of images. In the header, there is a button to turn off all overlays for the Image Editor. This option also toggles the visibility of UDIM tile information.

The options that are visible in the pop-over depend on the Image Editor mode. The following overlay categories are available:

Geometry

Display Texture Paint UVs

> Display the active object's UVs. The Image Editor must be in Paint mode, and the active object must be in Texture Paint Mode or Edit Mode for the UVs to be visible.

Image

Show Metadata

> Displays metadata about the selected Render Result. See the Output tab's Metadata panel to change what metadata to include.

Image Settings

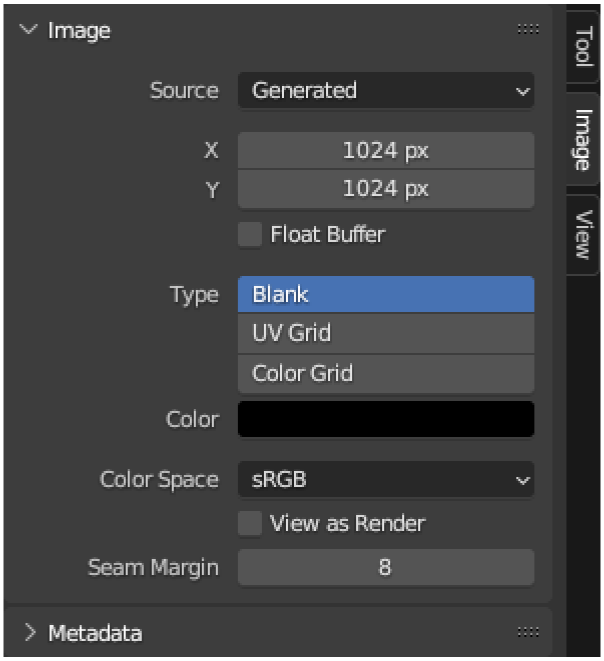


Image
Tool
Image
View
Float Buffer
Type
Blank
UV Grid
Color Grid
Color
View as Render
Metadata

Source: Generated
X: 1024 px
Y: 1024 px
Color Space: sRGB
Seam Margin: 8

Image tab.

Source

Select the type of image to use. For images that come from files, see [Supported Graphics Formats](#).

Single Image

A single, static image.

Image Sequence

An animation where each frame is stored in a separate file. See [Opening an Image Sequence](#). For options, see [Movie](#) below.

Movie

A video file. Note that if you want to do motion tracking and video compositing rather than simply using the video as a texture, you should load it into the Movie Clip Editor instead.

Note

The options below are for preview purposes only; they don't affect the 3D Viewport or the render. For that, see the Image Texture Node.

Note

Blender plays all videos at the scene framerate, not their original framerate, meaning they'll be faster or slower than intended if these framerates don't match up. To work around this, see the *Offset* field of the Image Texture Node linked above.

Frames

How many frames of the video to play. Past this point, the video will be paused (unless *Cyclic* is enabled).

Match Movie Length

Sets the *Frames* to the number of frames in the video file.

Start

Scene frame at which the video should start playing.

Offset

Number of frames to offset the video to an earlier point in time. (Put differently: how many frames at the start of the video to skip.)

Cyclic

Start over after the last frame to create a continuous loop.

Auto Refresh
Play the video in the Image Editor when the scene animation is playing. (The mouse cursor should be in the Image Editor or the Timeline when starting playback for this to work.)

Deinterlace
Apply deinterlacing to interlaced (analog) video.

Generated

Image generated by Blender.

X, Y
The width and height of the image in pixels.

Float Buffer
Creates a 32-bit image. This has a larger file size, but holds much more color information than the standard 8-bit image. For close-ups and large gradients, it may be better to use a 32-bit image.

Type

Blank::	Creates a blank image of a single specified color.
UV Grid::	Creates a checkerboard pattern with a colored cross (+) in each square.
Color Grid::	Creates a more complex colored grid with letters and numbers denoting locations. It could be used to check for stretching or distortion in the UV mapping.

Color
The fill color when creating a *Blank* image.

Common Options

File
Used for replacing or packing files.

Pack
Embed the resource into the current blend-file. See Packed Data.

Path
Path to the linked file.

Open
Opens the File Browser to select a file from a drive.

Reload
Reloads the file. Useful when it has been reworked in an external application.

Use Multi-View
See Multi-View.

Color Space
The Color Space the image file was saved in. This is used for converting the image to linear color (which is the color space Blender works with).

Textures and final renders are often stored in sRGB, while OpenEXR images are stored in a linear color space. Some images such as normal, bump or stencil maps do not strictly contain “colors” and should never have a color conversion applied to them. For such images, the color space should be set to *Non-Color*.

The list of color spaces depends on the active OCIO config. The default supported color spaces are described in detail here: Default OpenColorIO Configuration.

Alpha
How the image uses its Alpha Channel. This option is only available if the image format supports transparency.

Straight::	Store RGB and alpha channels separately with alpha acting as a mask, also known as unassociated alpha. Commonly used by image editing applications and file formats like PNG. This preserves colors in parts of the image with zero alpha.
Premultiplied::	Store RGB channels with alpha multiplied in, also known as associated alpha. The natural format for renders and used by file formats like OpenEXR. This can represent purely emissive effects like fire correctly, unlike straight alpha.
Channel Packed::	Different images are packed in the RGB and alpha channels, and they should not affect each other. Channel packing is commonly used by game engines to save memory.
None::	Ignore alpha channel from the file and make image fully opaque.

Half Float Precision

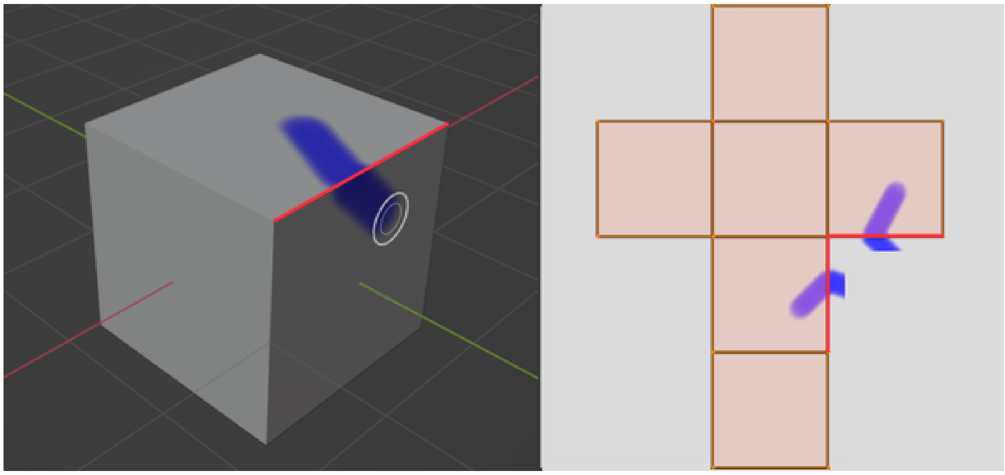
Load the image with a bit depth of only 16 bits per channel instead of 32, which saves memory.

View as Render

Apply the color management settings when displaying this image on the screen.

Seam Margin

The thickness of the margin around UV islands for texture painting to bleed into. This margin ensures that no unpainted pixels remain at the island border.



Painting a stroke across a seam in 3D space makes it extend past the UV island borders in the texture, until it gets cut off at the margin.

A higher value will result in a thicker margin, which can be useful if you intend to create mipmaps of the texture. However, this may also reduce painting performance.

Note

This setting only affects Sculpt Mode, where texture painting support is currently experimental. In Texture Paint Mode, a fixed margin is used instead.

Editing

New

Reference

Mode::	All Modes
Menu::	*Image ▸ New*
Shortcut::	`Alt-N`

Create a new Generated Image.

Open

Reference

Mode::	All Modes
Menu::	*Image ▸ Open*
Shortcut::	`Alt-O`

Load an image from a file.

Open Cached Render

Reference

Mode::	All Modes
Menu::	*Image ▸ Open Cached Render*
Shortcut::	`Ctrl-R`

Find the render cache file for the current scene and load it into the Render Result. This way, you can restore the last render from a previous Blender session and continue working in the Compositor without having to render the scene again.

Note that Blender doesn't create these cache files by default. You have to enable Cache Result in the scene's Output options and then render it at least once.

Replace

Reference

Mode::	All Modes
Menu::	*Image ‣ Replace*

Replace the current image by another.

Reload

Reference

Mode::	All Modes
Menu::	*Image ‣ Reload*
Shortcut::	`Alt-R`

Reload the image from the file on drive.

Edit Externally

Reference

Mode::	All Modes
Menu::	*Image ‣ Edit Externally*

Open the image in the *Image Editor* program specified in the File Paths Preferences.

Copy/Paste

Reference

Mode::	All Modes
Menu::	*Image ‣ Copy/Paste*

Copy and pastes images to/from a computers operating system.

Currently, only PNG files are supported and Linux support requires Wayland.

Save

Reference

Mode::	All Modes
Menu::	*Image ‣ Save*
Shortcut::	`Alt-S`

Save the image to its current path.

Important

While animation renders are automatically saved, still renders are not. These have to be saved manually.

Save As

Reference

Mode:: All Modes
Menu:: *Image ‣ Save As*
Shortcut:: `Shift-Alt-S`

Save the image to a separate file of any type. The image output settings can be configured and are the same as the Render Output Properties.

Save a Copy

Reference

Mode:: All Modes
Menu:: *Image ‣ Save a Copy*

Save the file under a specified name, but keep the old one open in the Image editor.

Save All Images

Reference

Mode:: All Modes
Menu:: *Image ‣ Save All Images*

Save all modified images. Packed images will be repacked.

Invert

Reference

Mode:: All Modes
Menu:: *Image ‣ Invert*

Invert Image Colors

Invert the colors of an image.

Invert Red/Green/Blue/Alpha Channel
Invert a single color channel.

Resize

Reference

Mode::	All Modes
Menu::	*Image ‣ Resize*

Adjust the image size in pixels.

Transform

Flip Horizontally
Mirrors the image so the left side becomes the right side.

Flip Vertically
Mirrors the image so the top becomes the bottom.

Rotate 90° Clockwise
Rotates the image clockwise 90°.

Rotate 90° Counter-Clockwise
Rotates the image counter-clockwise 90°.

Rotate 180°
Rotates the image 180°.

Pack

Reference

Mode::	All Modes

Menu:: *Image ‣ Pack*

Pack the image into the blend-file. See Packed Data.

Unpack

Reference

Mode:: All Modes
Menu:: *Image ‣ Unpack*

Unpack the image to a drive.

Extract Palette

Reference

Mode:: All Modes
Menu:: *Image ‣ Extract Palette*

Extract a Color Palette from the image for use by painting tools.

Generate Grease Pencil

Reference

Mode:: All Modes
Menu:: *Image ‣ Generate Grease Pencil*

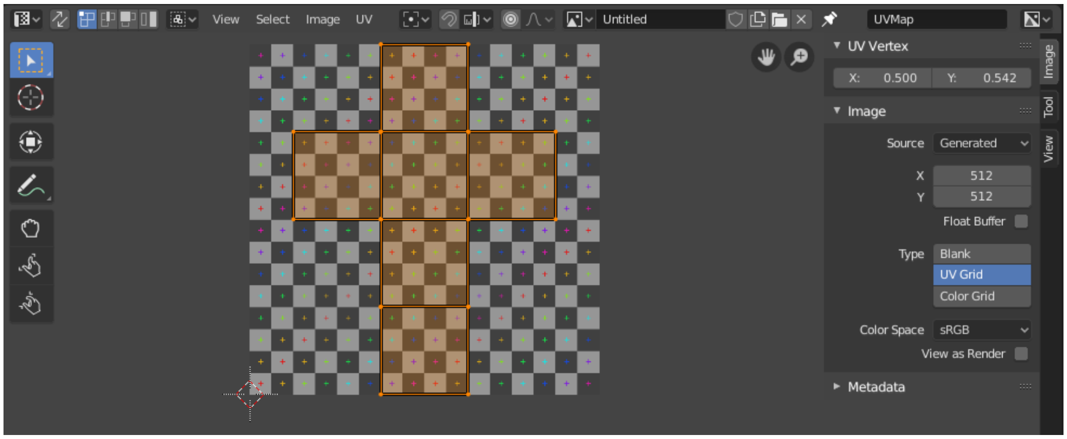
Create a Grease Pencil object using the currently selected image as a source.

UV Editor

- Introduction
    - UVs Explained
    - Interface
- Navigating
    - 2D Viewport
    - Gizmos
    - View Menu
    - 2D Cursor
- Overlays
    - Guides
    - UV Editing
    - Geometry
    - Image
- Sidebar
    - Image Tab
    - Tool Tab
    - View Tab
    - Scopes
- Selecting
    - Sync Selection
    - Selection Mode
    - Sticky Selection Mode
    - Select Menu
    - Shortest Path
    - Select Edge Loop
    - Select Edge Ring
- Snapping
    - Snap Target
    - Additional Options
    - Affect
    - Rotation Increment

Introduction

The UV Editor is used for editing UV maps, which describe how a 2D image should be mapped onto a 3D object.



X: 0.500 Y: 0.542

Source: Generated

X: 512

Y: 512

Float Buffer ☐

Type: Blank / UV Grid / Color Grid

Color Space: sRGB

View as Render ☐

UV Editor with a UV map and a test grid texture.

Image textures are typically needed when the desired look is hard to achieve with procedural textures, or if the texture is not uniform. For example, a car would only have scratches in a few places where they make sense, not in random places all over its body.

Blender offers a number of projections (Box, Sphere…) that automatically apply a 2D image to a 3D object, but these tend to only work for simple meshes. For more complex ones, you need to create a UV map instead. This is a flat area where each face of the 3D object is laid out on the 2D image, specifying which part of the image it should be textured with. This gives you complete control over the mapping process.

The name “UV” refers to the axes of the map: U for horizontal, V for vertical. These letters were chosen to avoid confusion with “X” and “Y”, which refer to axes in 3D space instead.

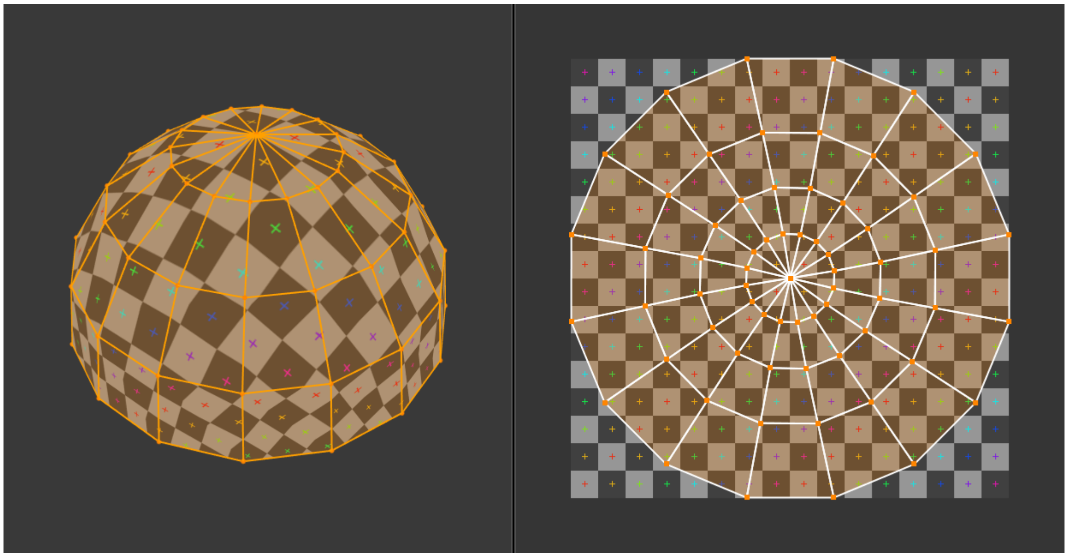
UVs Explained

The best analogy to understand UV mapping is cutting up a cardboard box. If you were to take a pair of scissors and cut along its edges, you would be able to spread it out flat on a tabletop. As you are looking down at the table, we could say that U is the left-right direction, and V is the up-down direction.

As a next step, you could put the spread-out box on top of a poster, cut the poster to match its shape, glue the poster to the box, and finally reassemble the box. You now have a 3D box textured with a 2D image.

A UV map describes how the box is cut up, and how it's laid out on the poster. You have complete freedom in how to do this: if you wanted to, you could cut each individual side of the box and position, rotate, scale, and even skew it on the poster independently of the other sides.

Example



3D space (XYZ) versus UV space.

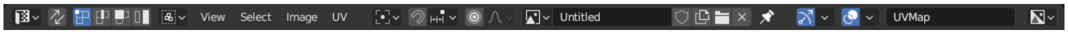
In the above image, a dome in 3D space is flattened into a disc in UV space. Each 3D face is then textured with the part of the image it covers in the UV map.

The image also demonstrates a common problem in UV maps: distortion. Notice how, even though the checkered squares in the 2D texture are all the same size, they get different sizes when applied to the 3D dome (they're smaller at the base than at the top). This is because the faces in the UV map have different relative sizes than in 3D space, which is a result of the flattening process.

You'll typically want to minimize this distortion by manually guiding and tweaking the flattening, using seams for example. However, it's not always possible to eliminate it completely.

Interface

Header



UV Editor header.

The header contains several menus and options for working with UVs.

Sync Selection

Synchronizes the selection between the UV Editor and the 3D Viewport. See Sync Selection for more details.

Selection Mode

The UV element type to select. See Selection Mode for more details.

Sticky Selection Mode

Which other vertices to select automatically. See Sticky Selection Mode for more details.

View

Tools for controlling how the content is displayed in the editor. See Navigating.

Select

Tools for selecting UVs.

Image

Tools for opening and manipulating images. See Editing.

UV

Contains tools for Unwrapping Meshes and Editing UVs.

Pivot `Period`

See Pivot Point.

Snap `Shift-Tab`

See Snapping.

Proportional Editing `O`

See Proportional Editing.

Image

A data-block menu used for selecting images. When an image has been loaded or created in the UV Editor, the Image panel appears in the Sidebar region.

Image Pin

When enabled the current image remains visible regardless of the object selection. This switching only happens if the 3D Viewport is in Edit Mode or Texture Paint Mode.

This can be useful to enable when an image is used as a reference.

Show Gizmo

Lets you show/hide all gizmos using the toggle button, or specific gizmos using the drop-down arrow.

Navigate

Enable/disable the gizmos used to pan or zoom the 2D viewport. See Navigation Gizmos for more information.

Show Overlays

Lets you show/hide all overlays using the toggle button, or specific overlays using the drop-down arrow. See Overlays.

Active UV Map Layer

Select which UV map to use.

Display Channels

Select what color channels are displayed.

Color & Alpha::	Enables transparency and shows a checkerboard behind the image.
Color::	Displays the colored image, without alpha channel.
Alpha::	Displays the alpha channel as a grayscale image. White areas are opaque, black areas are transparent.
Z-Buffer::	Displays the depth from the camera, from Clip Start to Clip End, as specified in the Camera settings.
Red, Green, Blue::	Single color channel visualized as a grayscale image.

Navigating

2D Viewport

Panning can be done by dragging with `MMB`.

Zooming can be done using `Wheel` or `NumpadPlus`/`NumpadMinus`.

Gizmos

Next to the Sidebar region at the top, there are gizmos that allow panning and zooming more comfortably when e.g. no mouse wheel is available.

View Menu

Also see Navigating in the Image Editor.

Frame Selected `NumpadPeriod`
    Change the view so that all selected UV vertices are visible.

2D Cursor

Just like the 3D Viewport, the UV Editor has a Cursor that you can jump to (*View ‣ Center View to Cursor*). It can also serve as a pivot point and a snapping target.

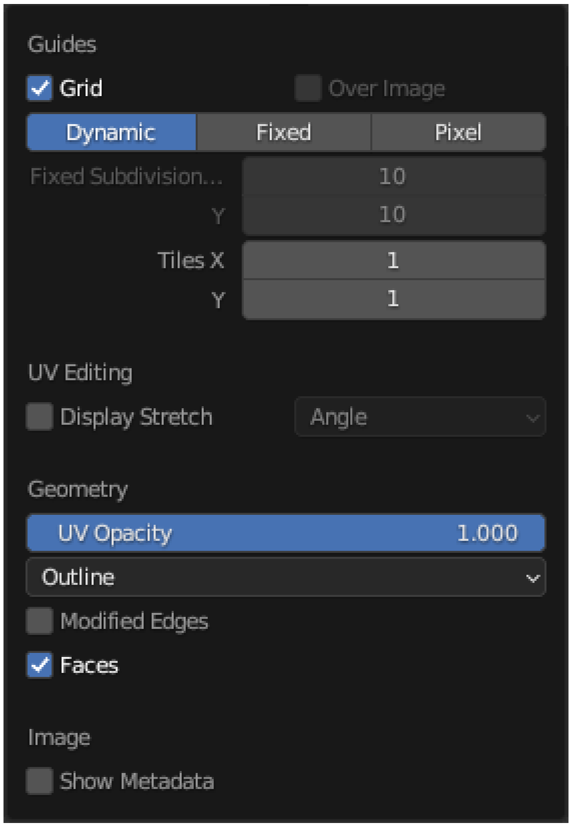
To change the Cursor's position, either press `LMB` with the Cursor tool selected, or `Shift-RMB` with any tool selected. You can also change the "Location X/Y" fields in the *View* tab of the Sidebar, in either relative coordinates (0 to 1) or pixel coordinates. In both cases, the lower left corner of the image serves as the origin (0, 0).

You can press `Shift-C` to move the Cursor to the center.

Overlays

In the header, there is a button to turn off all overlays for the UV Editor. This option also toggles the visibility of UDIM tile information.

The drop-down button opens a pop-over with more detailed settings. The following categories are available:



Guides

☑ Grid ☐ Over Image

Dynamic | Fixed | Pixel

Fixed Subdivision... 10

Y 10

Tiles X 1

Y 1

UV Editing

☐ Display Stretch Angle

Geometry

UV Opacity 1.000

Outline

☐ Modified Edges

☑ Faces

Image

☐ Show Metadata

The Overlays pop-over.

Guides

Grid
  Show the grid.

Over Image
  Show the grid on top of the image rather than behind it.

Grid Shape Source
  How the row and column counts are determined.

Dynamic::	The grid starts at 8×8 cells that are automatically subdivided further as you zoom in.
Fixed::	The row and column counts are fixed and can be configured manually.
Pixel::	Each grid cell matches one image pixel.

Fixed Subdivisions X, Y

Number of columns/rows in the grid.

Tiles X, Y

The number of UDIM tile grids to display in each cardinal direction.

UV Editing

Display Stretch

Show how much of a shape difference there is between UV space and 3D space. Blue means low distortion, red means high. You can choose whether to display the distortion based on *Angle* or *Area*.

Geometry

UV Opacity

Opacity of edges and faces.

Display As

Control how edges are shown.

Outline::	Display edges in gray with a black outline.
Dash::	Display edges as dashed black-gray lines.
Black::	Display edges in black.
White::	Display edges in white.

Modified Edges

Additionally show the edges as they look after applying modifiers (in gray).

Faces

Display faces over the image.

Image

Show Metadata

Display metadata about the selected Render Result. See the Output tab's Metadata panel to change what metadata to include.

Sidebar

Image Tab

UV Vertex

The averaged-out position of the selected UV vertices.

Image

See Image Settings.

UDIM Tiles

See UDIM Tiles.

Tool Tab

Shows the settings for the active tool.

View Tab

Display

You can set the editor’s display options in this panel.

Aspect Ratio X, Y
: Display aspect for this image. Does not affect rendering.

Repeat Image
: Tile the image so it completely fills the editor.

Pixel Coordinates

Use pixel coordinates rather than relative coordinates (0 to 1) for the UV Vertex and 2D Cursor Location fields.

2D Cursor

Location X, Y
View and change the location of the 2D Cursor.

Annotations

Options for the Annotate tool.

Scopes

See Scopes in the Image Editor.

Selecting

Much like the 3D Viewport, the UV Editor has selection mode buttons in the header, as well as a *Select* menu.

Sync Selection

If turned off (the default), the UV Editor only shows the faces that are selected in the 3D Viewport. Selecting an item in one editor does not automatically select it in the other. If one 3D vertex/edge corresponds to multiple UV vertices/edges, you can select each of those individually.

If turned on, the UV Editor always shows all faces. Selecting an item in one editor also selects it in the other. If one 3D vertex/edge corresponds to multiple UV vertices/edges, you can't select those individually (you can only select all of them).

Selection Mode

Vertex::	`1` Select vertices.
Edge::	`2` Select edges.
Face::	`3` Select faces.
Island::	`4` Select contiguous groups of faces. Only available if *Sync Selection* is disabled.

If *Sync Selection* is enabled, you can hold `Shift` while clicking a selection mode to activate multiple ones at the same time, or `Ctrl` to expand/contract the selection.

See also

Mesh Selection

Sticky Selection Mode

Options for automatically selecting additional UV vertices. Only available if *Sync Selection* is disabled.

Disabled
: Each UV vertex can be selected independently of the others.

Shared Location
: Automatically select UV vertices that correspond to the same mesh vertex and have the same UV coordinates. This is the default and gives the illusion that multiple faces in a UV map can share the same vertex; in reality, they have separate vertices that overlap.

Shared Vertex
: Automatically select UV vertices that correspond to the same mesh vertex, even if they have different UV coordinates. This is also the behavior when *Sync Selection* is enabled.

Select Menu

All `A`
: Selects all UV elements.

None `Alt-A`
: Deselects all UV elements.

Invert `Ctrl-I`
: Inverts the current selection.

Box Select `B`
: See Box Select.

Box Select Pinned `Ctrl-B`
: Like *Box Select*, but only selects pinned UV vertices.

Circle Select

See Circle Select.

Lasso Select

See Lasso Select.

More/Less `Ctrl-NumpadPlus`, `Ctrl-NumpadMinus`

Expands/contracts the selection to/from the adjacent elements.

Select Similar `Shift-G`

Selects UV elements that are similar to the active one in some way. The Adjust Last Operation panel provides several options:

Type

The property to compare. Which properties are available depends on the Selection Mode.

Vertex Selection Mode

Pinned::	Selects vertices with the same pinned state.

Edge Selection Mode

Length::	Selects edges with a similar length in the UV map.
Length 3D::	Selects edges with a similar length in the 3D mesh.
Pinned::	Selects edges with the same pinned state.

Face Selection Mode

Area::	Selects faces with a similar area in the UV map.
Area 3D::	Selects faces with a similar area in the 3D mesh.
Material::	Selects faces that have the same Material.
Object::	Selects faces that belong to the same object. This is useful when multiple objects are in Edit mode at once.
Polygon Sides::	Selects faces with a similar number of edges.

Winding::	Select faces that have the same orientation (facing upwards or downwards in the UV map).

Island Selection Mode

Area::	Selects islands with a similar area in the UV map.
Area 3D::	Selects islands with a similar area in the 3D mesh.
Amount of Faces in Island::	Selects islands with a similar number of faces.

Compare

The comparison operator.

Equal::	Select elements whose value is equal.
Greater::	Select elements whose value is greater or equal.
Less::	Select elements whose value is less or equal.

Threshold

Tolerance for values that are almost, but not quite the same. A higher threshold will select more elements.

Select Linked

Linked `Ctrl-L`

Selects all elements that are connected to the currently selected ones.

Shortest Path

Selects the path between two selected elements. (See below)

Select Pinned `Shift-P`

Selects all pinned UVs.

Select Split `Y`

“Detaches” the selected faces so they can be moved elsewhere without affecting their neighbors.

Hint

Unlike Split Selection for meshes, which physically disconnects faces, this is a pure selection operator. In UV space, the faces were never connected to begin with; it only seemed that way because *Sticky Selection* automatically selected the vertices of the neighboring faces. *Select Split* deselects those vertices again.

As an alternative to *Select Split*, you can set the *Sticky Selection Mode* to *Disabled*.

Select Overlap

Selects all UV faces that overlap each other.

Shortest Path

Reference

Mode::	Edit Mode
Menu::	*Select* ‣ *Select Linked* ‣ *Shortest Path*
Shortcut::	`Ctrl-LMB`

Selects all the UV elements along the shortest path between two elements: the two selected elements when activated using the menu, or the active one and the clicked one when activated using the shortcut.

Face Stepping

For vertices: allows the path to step across faces, following their diagonal rather than their edges.

For edges: selects disconnected edges that are perpendicular to the path (edge ring), rather than connected edges along the path (edge loop).

For faces: allows the path to go through faces that only share a vertex, rather than an edge.

Topology Distance

Calculates the distance by simply counting edges rather than measuring their lengths.

Fill Region `Shift-Ctrl-LMB`

Selects all shortest paths (rather than just one).

Dashed Line Options

Allows to only select elements at regular intervals, creating a “dashed line” rather than a continuous one.

Deselected

The number of deselected elements in the repetitive sequence.

Selected

The number of selected elements in the repetitive sequence.

Offset

The number of elements to offset the sequence by.

See also

Mesh edit Select Shortest Path.

Select Edge Loop

Reference

Mode::	Edit Mode
Shortcut::	`Alt-LMB`, or `Shift-Alt-LMB` for extending the existing selection.

Holding `Alt` while clicking an edge selects that edge and then expands the selection as far as possible in the two directions parallel to it. (While this of course works for selecting edge “loops” that go all the way around a mesh, it also works if there’s no loop.)

You can additionally hold `Shift` to extend the current selection rather than replacing it.

See also

Mesh edit Select Edge Loops.

Select Edge Ring

Reference

Mode::	Edit Mode
Shortcut::	`Ctrl-Alt-LMB`, or `Shift-Ctrl-Alt-LMB` for extending the existing selection.

Holding `Ctrl-Alt` while clicking an edge selects that edge and then expands the selection as far as possible in the two directions perpendicular to it. (While this of course works for selecting edge “rings” that go all the way around a mesh, it also works if there’s no ring.)

You can additionally hold `Shift` to extend the current selection rather than replacing it.

See also

Mesh edit Select Edge Rings.

Snapping

Snapping lets you easily align UV elements to others. It can be toggled by clicking the magnet icon in the UV Editor's header, or more temporarily by holding `Ctrl`.

This page is about the Snap header button; for the Snap menu, see UV Editing.

Snap Target

Reference

Header::	*Snapping* ▸ *Snap To*
Shortcut::	`Shift-Ctrl-Tab`

Increment

Snaps to grid points.

This option snaps to an imaginary grid that starts at the selection's original location and has the same resolution as the grid displayed in the editor. In other words, it lets you move the selection in "increments" of the grid cell size.

Grid

Snaps to grid points.

Vertex

Snaps to the vertex that's closest to the mouse cursor.

Additional Options

Snap Base *Vertex*

See 3D Viewport Snapping for more information.

Affect

Specifies which transformations are affected by snapping. By default, snapping only happens while moving something, but you can also enable it for rotating and scaling.

Rotation Increment

Angle used in incremental snapping for the rotation operator. The second value is the **Rotation Precision Increment**, used for finer transformations and activated by default with the `Shift` key.

Compositor

The Compositor lets you manage nodes for compositing.

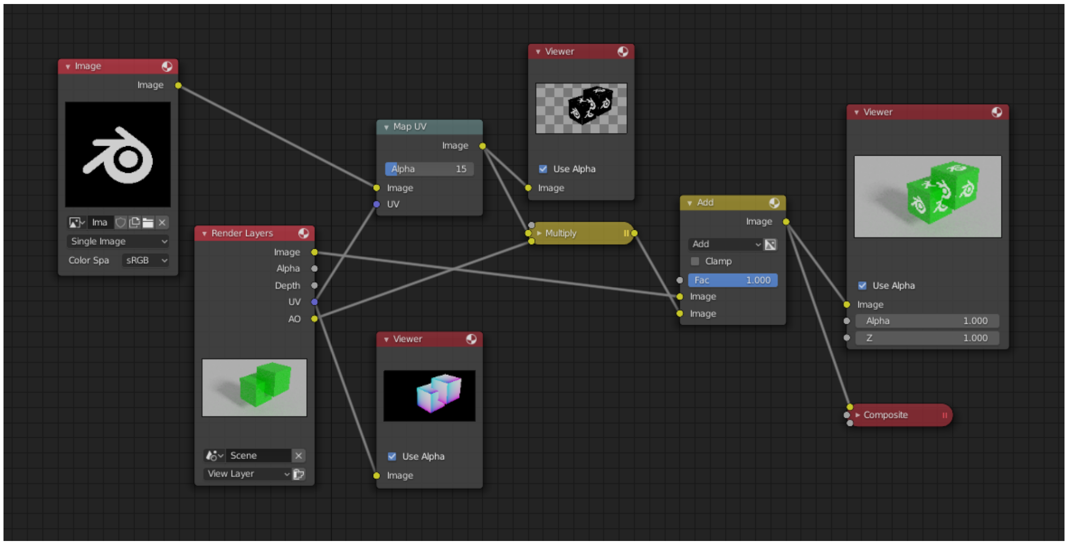


Image
Image
Ima
Single Image
Color Spa
sRGB
Render Layers
Image
Alpha
Depth
UV
AO
Scene
View Layer
Map UV
Image
Alpha
15
Image
UV
Viewer
Use Alpha
Image
Multiply
Viewer
Use Alpha
Image
Add
Image
Add
Clamp
Fac
1.000
Image
Image
Viewer
Use Alpha
Image
Alpha
1.000
Z
1.000
Composite

Nodes in the Compositor.

The use of the Compositor is explained in Compositing.

Texture Nodes

- Introduction
  - Using Texture Nodes
  - Header

Node Types

- Color Nodes
- Converter Nodes
- Distort Nodes
- Input Nodes
- Output Nodes
- Pattern Nodes
- Texture Nodes
- Group

Introduction

The Texture Node Editor allows creating custom textures by combining colors, procedural patterns, and images in various ways. This is a step up from the built-in textures, where you can select a type from a list and not much more.

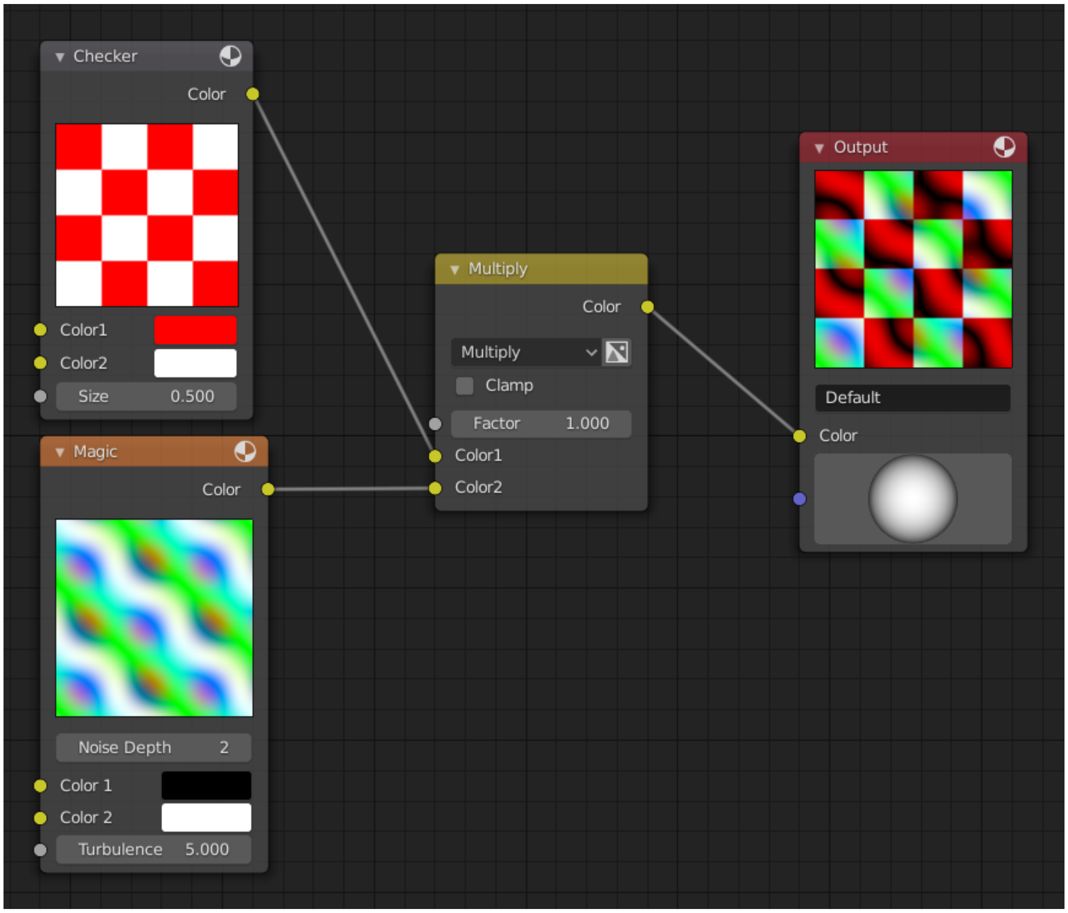
Note

Textures – both built-in ones and node-based ones – are a legacy feature. For their original main purpose, which was of course texturing objects, they have been replaced by Materials which are set up in the Shader Editor.

Today, the use of Textures is limited to:

- Brushes.
- The Displace Modifier.
- Influencing size, density etc. of particle systems.
- Influencing emission locations of fire/smoke simulations.
- Compositing.

In addition, the Displace modifier and fire/smoke simulations don't support node-based textures, instead only working with the built-in ones.


Checker
Color
Color1
Color2
Size 0.500
Magic
Color
Noise Depth 2
Color 1
Color 2
Turbulence 5.000
Multiply
Color
Multiply
Clamp
Factor 1.000
Color1
Color2
Output
Default
Color

Combined textures based on nodes.

Using Texture Nodes

The default Blender layout has no workspace containing the Texture Node Editor. You need to manually open it in an area of choice.

Once the editor is open, you first need to set the empty *Texture Type* selector to *Brush*, after which you can use the Data-Block Menu to start creating textures. Note that you need to enable *Use Nodes* in the header before you can add nodes.

Header

See Nodes for the header items common to all node editors.

Texture Type

World

Deprecated – the scene’s World Environment is now defined using a Material rather than a Texture.

Brush

Show brush Textures in the data-block menu. Because the other two types are deprecated, this effectively shows all Textures.

Line Style

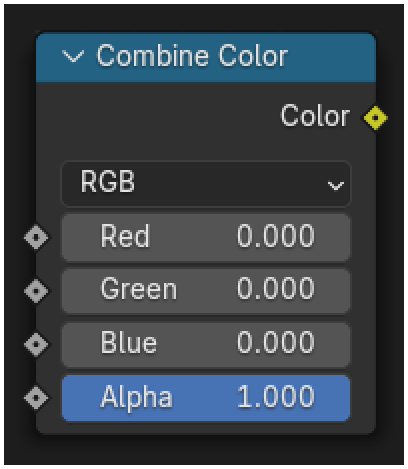
Deprecated – Line Styles for the Freestyle renderer are now defined using Materials rather than Textures.

Color Nodes

- Combine Color Node
- Invert Color Node
- Mix Node
- RGB Curves Node
- Hue/Saturation/Value Node
- Separate Color Node

Combine Color Node

Combines four grayscale channels into one color image, based on a particular Color Model.



RGB
Red 0.000
Green 0.000
Blue 0.000
Alpha 1.000

Inputs

The inputs of this node depend on the Mode property (see below).

Alpha
: The opacity of the output color.

Properties

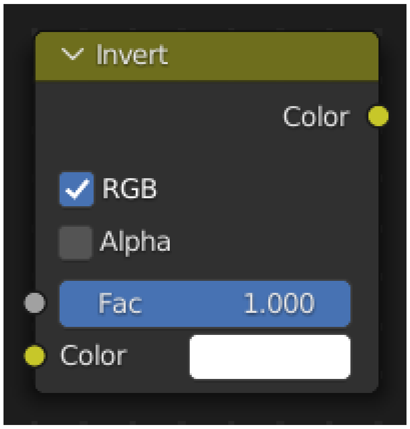
Mode
: The color model to use.

RGB::	Red, Green, Blue.
HSV::	Hue, Saturation, Value.
HSL::	Hue, Saturation, Lightness.

Output

Color
: Standard color output.

Invert Color Node


Invert
Color
RGB
Alpha
Fac
1.000
Color

Inverts the colors in the input image, producing a negative.

Inputs

Factor
: The amount of influence the node exerts on the image.

Color
: Standard color input.

Properties

In the compositing context, this node has the following properties:

RGB
: Invert the color channels.

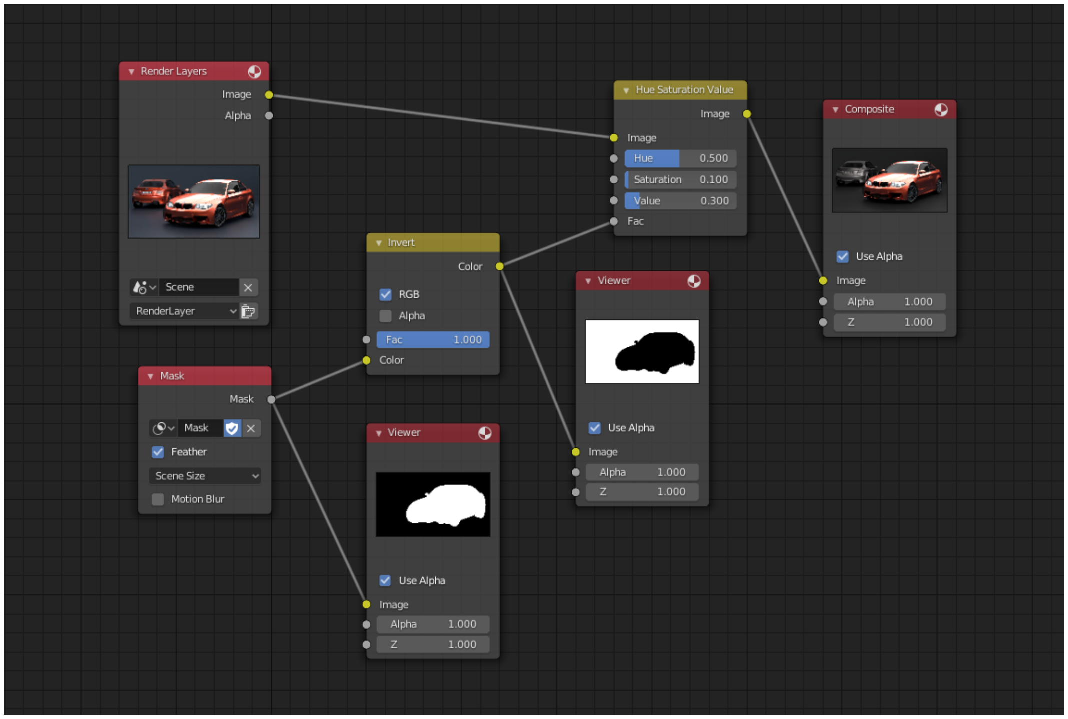
Alpha
: Invert the alpha channel.

Outputs

Color

Standard color output.

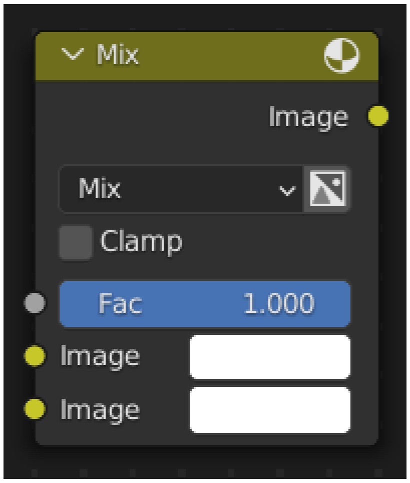
Example


Render Layers
Image
Alpha
Scene
RenderLayer
Hue Saturation Value
Image
Image
Hue 0.500
Saturation 0.100
Value 0.300
Fac
Composite
Use Alpha
Image
Alpha 1.000
Z 1.000
Invert
Color
RGB
Alpha
Fac 1.000
Color
Viewer
Use Alpha
Image
Alpha 1.000
Z 1.000
Mask
Mask
Mask
Feather
Scene Size
Motion Blur
Viewer
Use Alpha
Image
Alpha 1.000
Z 1.000

The Invert node is used to invert the mask.

Mix Node

Blends two images together, much like how an image editing program blends two layers.



Inputs

Fac
: The opacity of the foreground image.

Image
: The background image. Determines the dimensions of the output.

Image
: The foreground image.

Keep in mind that, unlike image editing programs where the foreground layer is on top, the foreground slot in Blender is on the bottom.

Properties

Blending Mode
: The blending mode to use.

Mix

Regular alpha blending. Typically called *Normal* in image editing programs.

Darken

For each color component, takes the smallest of the two values being blended.

Multiply

Multiplies the colors component by component. Blending with a white pixel (value 1.0) has no effect, while blending with a black one (0.0) always results in black.

Color Burn

Inverts the background color, divides it by the foreground color, and inverts the result.

Lighten

For each color component, takes the largest of the two values being blended.

Screen

Inverts both colors, multiplies them, and inverts the result.

Color Dodge

Divides the background color by the inverted foreground color.

Add

Adds the two colors together.

Overlay

Applies Multiply blending if the foreground color's lightness is below 0.5, or Screen blending if it's above.

Soft Light

Like Overlay, but more subtle.

Linear Light

Applies Linear Burn blending (background + foregound - 1) if the foreground color's lightness is below 0.5, or Linear Dodge (background + foreground) if it's above.

Difference

For each component, subtracts the lower value from the higher value.

Exclusion

Adds the two colors, then subtracts their multiple twice.

Subtract

Subtracts the foreground color from the background color.

Divide

Divides the background color by the foreground color.

Hue

Combines the saturation and value of the background color with the hue of the foreground color.

Saturation

Combines the hue and value of the background color with the saturation of the foreground color.

Color

Combines the value of the background color with the hue and saturation of the foreground color.

Value

Combines the hue and saturation of the background color with the value of the foreground color.

Use Alpha

Whether to use the alpha channel of the foreground image during mixing. The alpha channel of the background image is always used.

Clamp

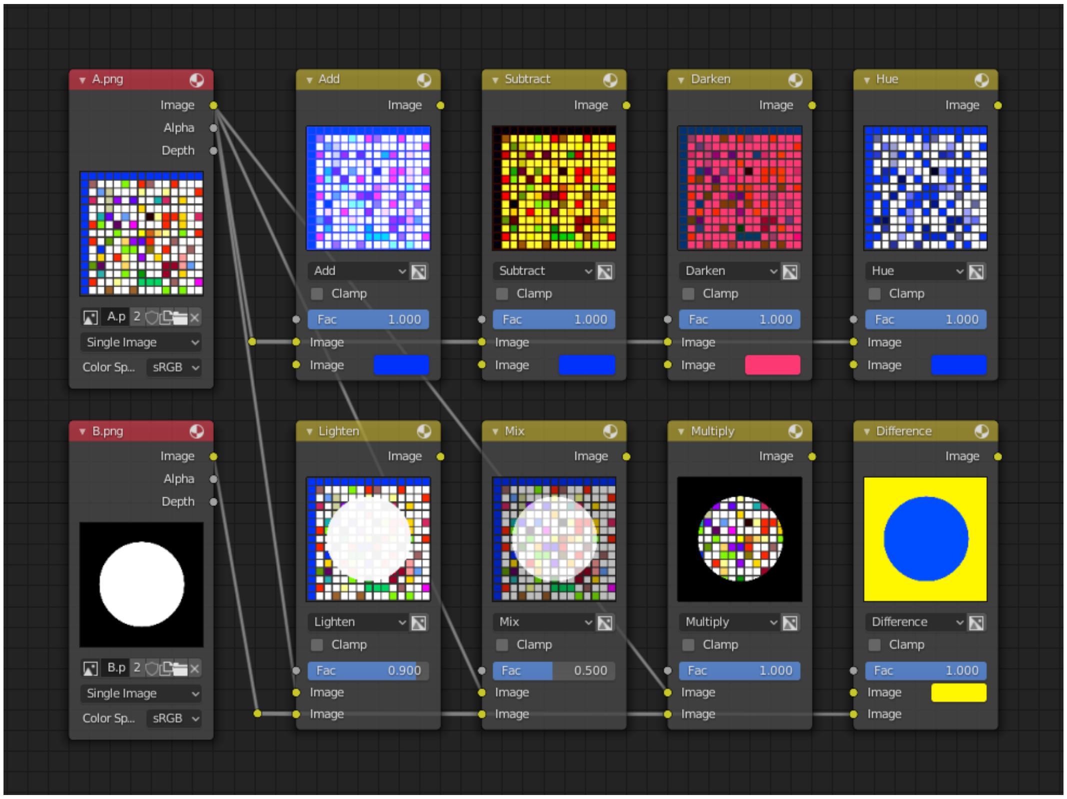
Clamp the output value to the [0.0, 1.0] range.

Outputs

Image
The result of the mixing operation.

Examples

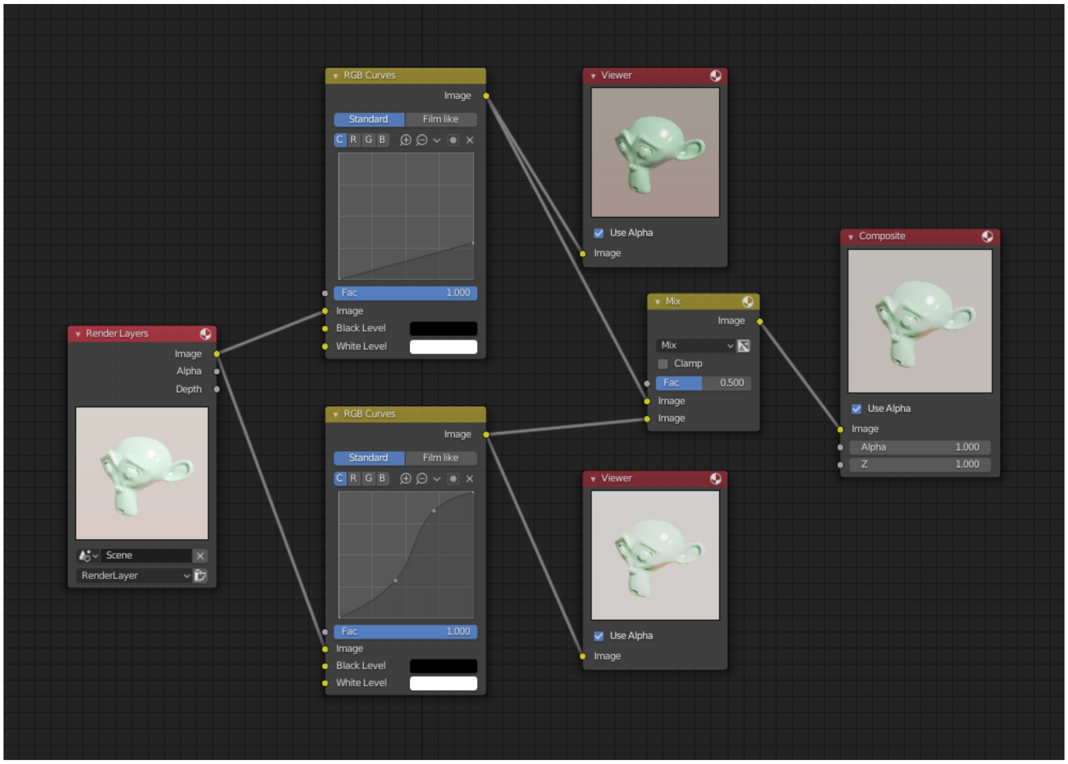
Below are examples of blending modes, as well as some practical use cases.


A.png
Image
Alpha
Depth
Single Image
Color Sp...
sRGB
B.png
Add
Subtract
Darken
Hue
Lighten
Mix
Multiply
Difference
Clamp
Fac
1.000
0.900
0.500

Blending a colored pattern with a flat color (top row) and a circular mask (bottom row).

Fixing overexposure

The Compositing setup below shows how to fix an overexposed render by darkening it and increasing contrast.


Render Layers
Image
Alpha
Depth
Scene
RenderLayer
RGB Curves
Image
Standard
Film like
C R G B
Black Level
White Level
RGB Curves
Image
Standard
Film like
C R G B
Black Level
White Level
Viewer
Use Alpha
Image
Viewer
Use Alpha
Image
Mix
Image
Clamp
Image
Image
Composite
Use Alpha
Image

Fac 1.000

Fac 1.000

Mix

Fac 0.500

Alpha 1.000

Z 1.000

Example node setup showing two RGB Curves nodes and a Mix node for composition.

The top RGB Curves Node darkens the image by linearly scaling each color value to a smaller one.

The bottom curve node increases constract by making small values smaller and large values larger.

Finally, the Mix node blends the two together.

Watermark Images

In the old days, a pattern was pressed into the paper mush as it dried, creating a mark that identified who made the paper and where it came from. The mark was barely perceptible except in just the right light. Probably the first form of subliminal advertising.

Nowadays, people watermark their images to identify them as personal intellectual property, for subliminal advertising of the author or hosting service, or simply to track their image's proliferation throughout the web.

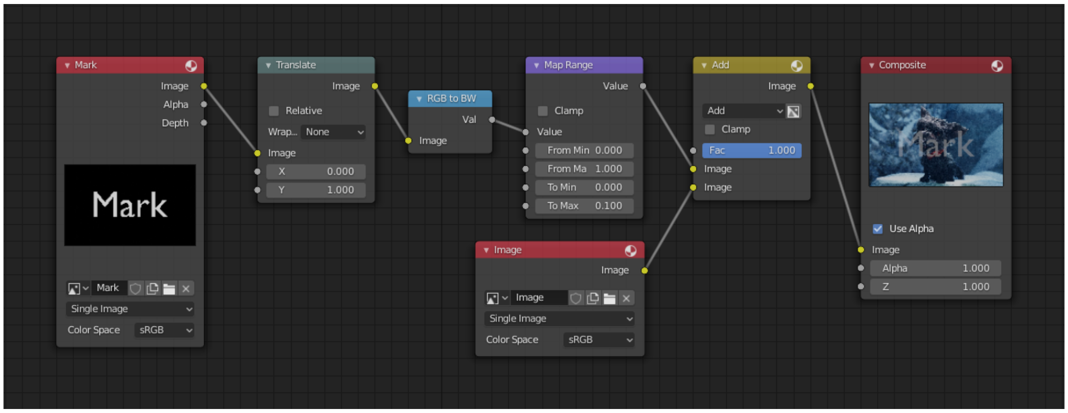
Blender provides a complete set of tools for you to both encode your watermark and to tell if an image has your watermark.

Encoding your Watermark in an Image

First, construct your own personal watermark. You can use your name, a word, or a shape or image not easily replicated. While neutral gray works best using the encoding method suggested, you are free to use other colors or patterns. It can be a single pixel or a whole gradient; it is up to you.

In the example below, we are encoding the watermark in a specific location in the image using the *Translate* node; this helps later because we only have to look at a specific location for the mark. We then use the *RGB to BW node* to convert the color image to grayscale numbers, which we then feed into the *Map Range* node to reduce the mark to one-tenth of its original intensity.

The *Add* node (*Mix* node with blending mode *Add*) adds the corresponding pixels, making the ones containing the mark ever-so-slightly brighter.



Mark: Single Image, Color Space sRGB

Translate: ☐ Relative, Wrap... None, X 0.000, Y 1.000

Map Range: ☐ Clamp, From Min 0.000, From Ma 1.000, To Min 0.000, To Max 0.100

Add: Add, ☐ Clamp, Fac 1.000

Image: Single Image, Color Space sRGB

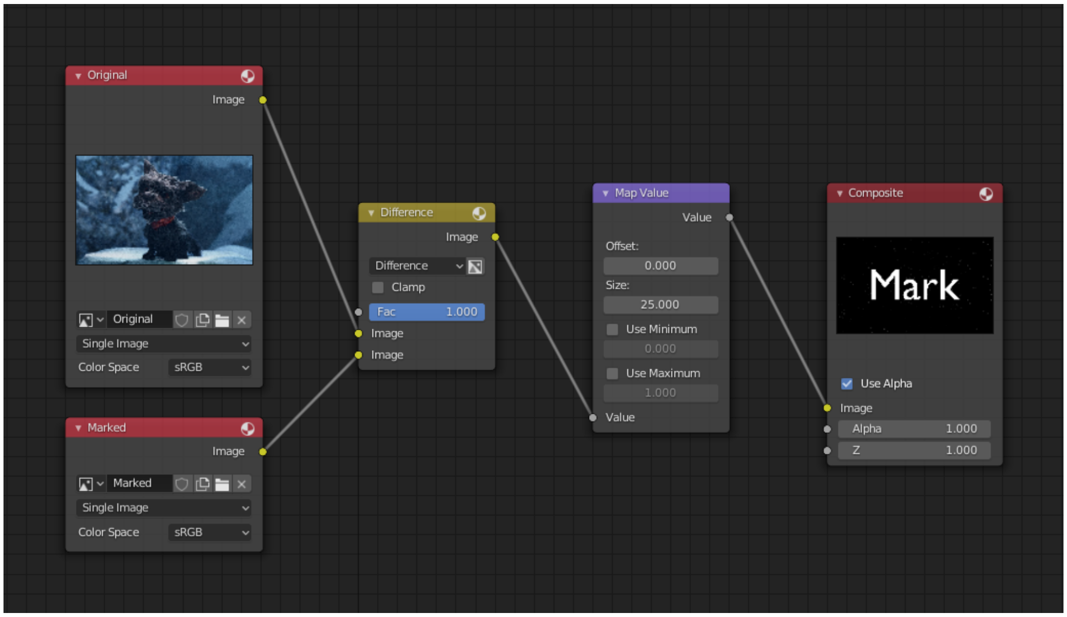
Composite: ☑ Use Alpha, Alpha 1.000, Z 1.000

Embedding a watermark in an image.

Of course, if you *want* people to notice your mark, do not scale it so much, or make it a contrasting color. There are also many other ways, using other mix settings and fancier rigs. Feel free to experiment!

Decoding an Image for your Watermark

When you see an image that you think might be yours, use the node tree below to compare it to your stock image (pre-watermarked original). In this tree, the *Mix* node is set to Difference, and the *Map Value* node amplifies any difference. You can see how the original mark clearly stands out.


Original
Image
Marked
Image
Difference
Image
Image
Image
Map Value
Value
Value
Composite
Mark
Image

Original: Original, Single Image, Color Space: sRGB

Marked: Marked, Single Image, Color Space: sRGB

Difference: Difference, ☐ Clamp, Fac 1.000

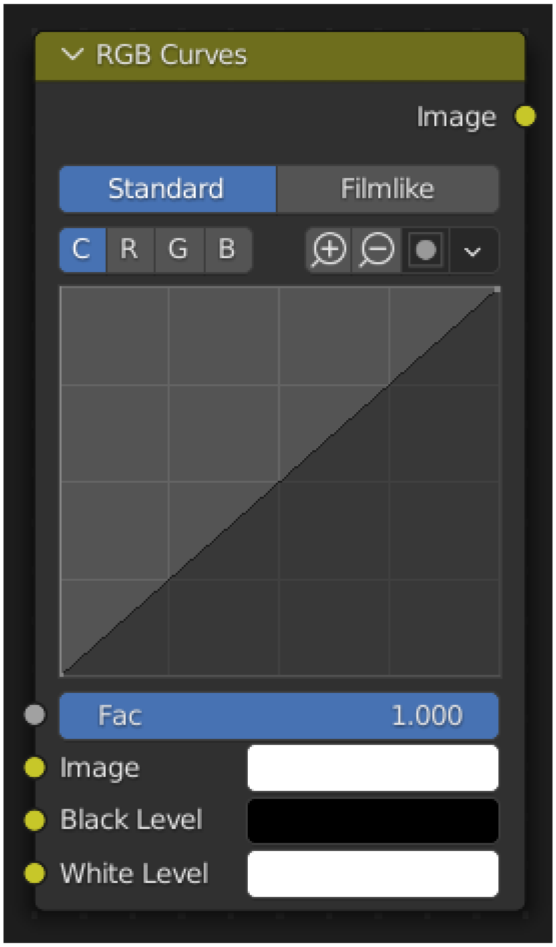
Map Value: Offset: 0.000, Size: 25.000, ☐ Use Minimum 0.000, ☐ Use Maximum 1.000

Composite: ☑ Use Alpha, Alpha 1.000, Z 1.000

Checking an image for your watermark.

RGB Curves Node

The *RGB Curves Node* performs level adjustments on each color channel.


RGB Curves
Image
Standard
Filmlike
C
R
G
B
Fac
1.000
Image
Black Level
White Level

Inputs

Factor
: Controls the amount of influence the node exerts on the image.

Image/Color
: Standard color input.

Black Level *Compositor Only*
: Defines the input color that should be mapped to black.

White Level *Compositor Only*

Defines the input color that should be mapped to white.

Tip

To define the black and white levels, use the eyedropper to select a color sample of a displayed image.

Properties

Tone *Compositor Only*

Standard::	The Combined curve is applied to each channel individually, which may result in a change of hue.
Filmlike::	Keeps the hue constant.

Channel

The curve to show.

C::	Combined
R::	Red
G::	Green
B::	Blue

Curve

A Bézier curve that maps each input level (X axis) to an output level (Y axis). For the curve controls, see Curve widget.

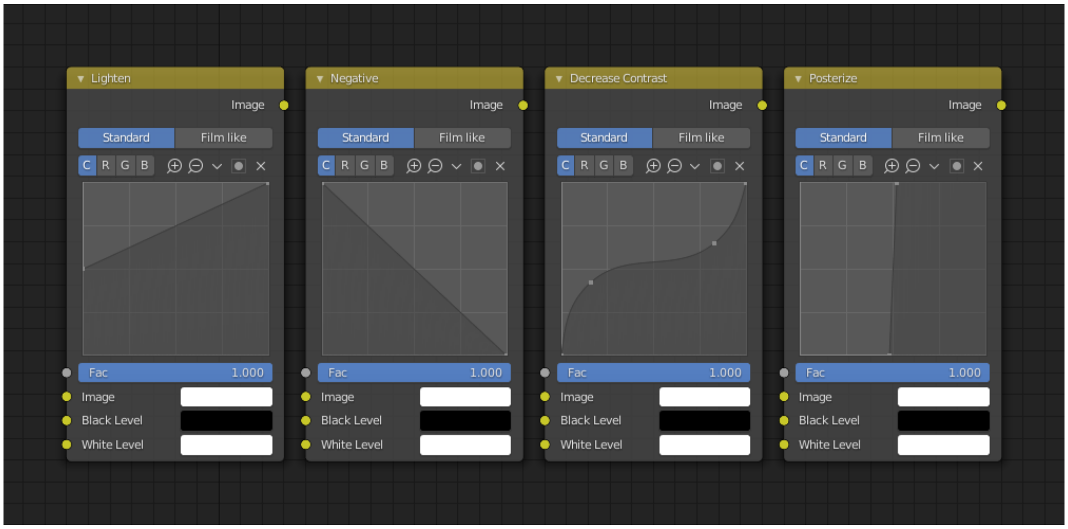
Outputs

Image/Color

Standard color output.

Examples

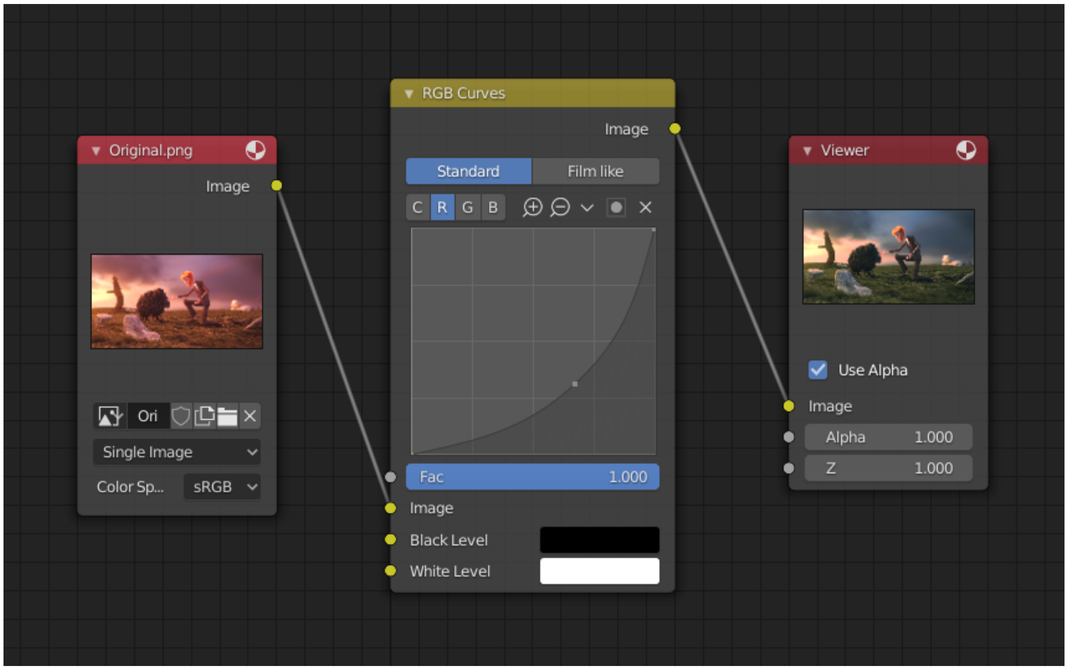
Below are some common curves you can use to achieve desired effects.


Lighten
Negative
Decrease Contrast
Posterize
Image
Standard
Film like
C R G B
Image
Black Level
White Level

Fac 1.000

From left to right: 1. Lighten shadows 2. Negative 3. Decrease contrast 4. Posterize.

Color Correction using Curves


Original.png
Image
Ori
RGB Curves
Image
Standard
Film like
C R G B
Image
Black Level
White Level
Viewer
Image

Single Image
Color Sp... sRGB
Fac 1.000
☑ Use Alpha
Alpha 1.000
Z 1.000

Color correction with curves.

In this example, the image has too much red in it, so we run it through an *RGB Curves* node and reduce the Red channel.

The documentation for the Mix Node has an additional example about fixing overexposure.

Color Correction using Black/White Levels

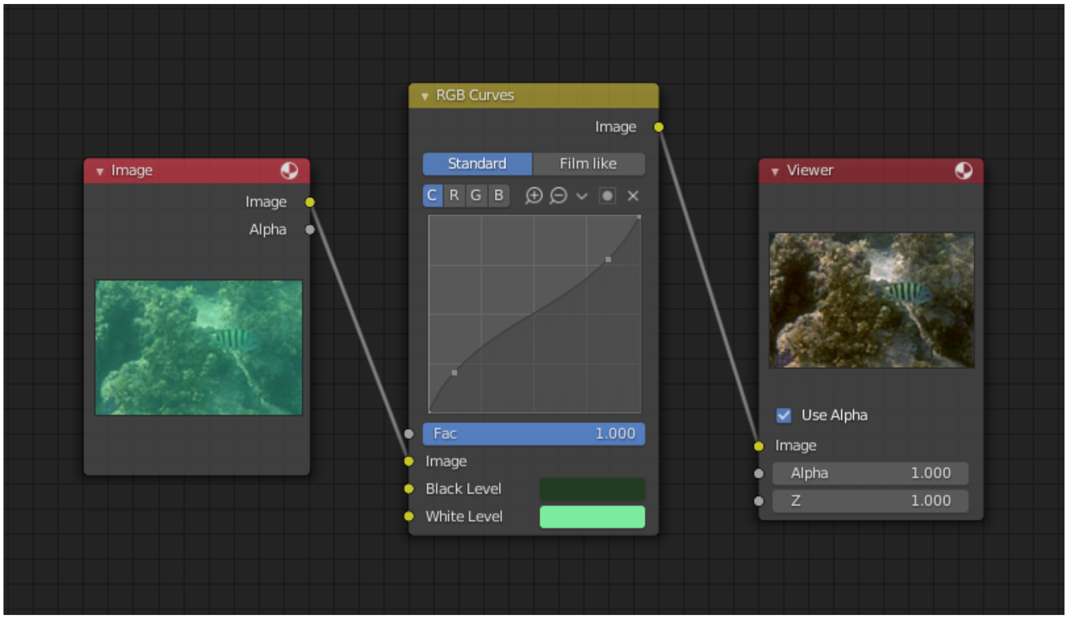


Image
Image
Alpha
RGB Curves
Image
Standard
Film like
C
R
G
B
Fac 1.000
Image
Black Level
White Level
Viewer
Use Alpha
Image
Alpha 1.000
Z 1.000

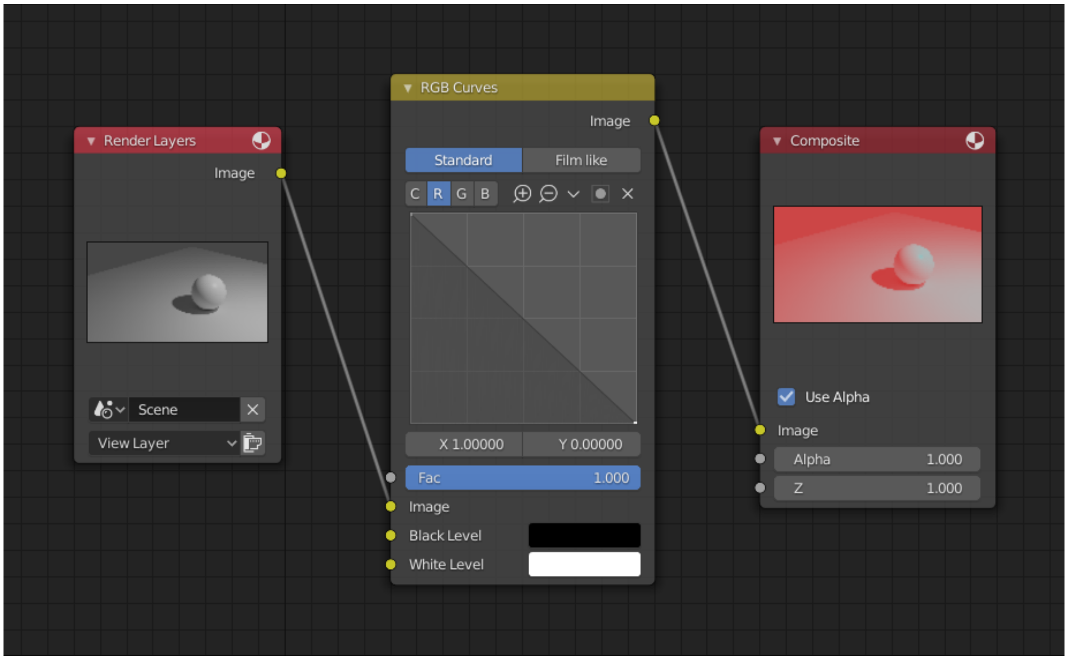
Color correction with Black/White Levels.

Manually adjusting the RGB curves for color correction can be difficult. Another option for color correction is to use the Black and White Levels instead, which really might be their main purpose.

In this example, the White Level is set to the color of a bright spot of the sand in the background, and the Black Level to the color in the center of the fish’s eye. To do this efficiently it is best to bring up the Image Editor showing the original input image. You can then use the levels’ color picker to easily choose the appropriate colors from the input image, zooming into pixel level if necessary. The result can be fine-tuned with the R, G, and B curves like in the previous example.

The curve for C is used to compensate for the increased contrast that is a side effect of setting Black and White Levels.

Effects


Render Layers
Image
Scene
View Layer
RGB Curves
Image
Standard
Film like
C
R
G
B
Image
Black Level
White Level
Composite
Use Alpha
Image

X 1.00000 Y 0.00000

Fac 1.000

☑ Use Alpha

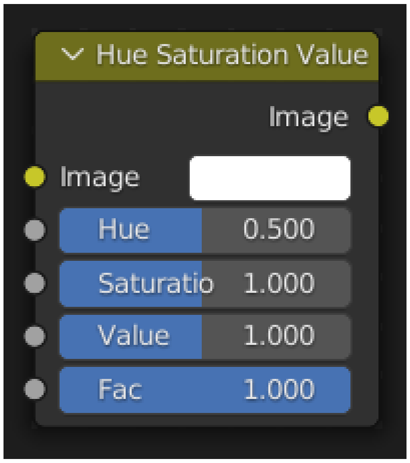
Alpha 1.000

Z 1.000

Changing colors by inverting the red channel.

Hue/Saturation/Value Node

The *Hue/Saturation/Value Node* applies a color transformation in the HSV Color Model.



Hue 0.500
Saturatio 1.000
Value 1.000
Fac 1.000

Inputs

Factor
: The amount of influence the node exerts on the image.

Image/Color
: Standard color input.

Hue
: The hue rotation offset, from 0 (-180°) to 1 (+180°). Note that 0 and 1 have the same result.

Saturation
: A value of 0 removes color from the image, making it black-and-white. A value greater than 1.0 increases saturation.

Value
: The value shift. 0 makes the color black, 1 keeps it the same, and higher values make it brighter.

Outputs

Image/Color

Standard color output.

Hue/Saturation Tips

Some things to keep in mind that might help you use this node better:

Hues are laid out on a circle

If you apply a Hue offset of 1 (+180°) to a blue image, you get the diametrically opposite color, which is yellow. If you apply a Hue offset of 1 to that yellow image, you get blue again.

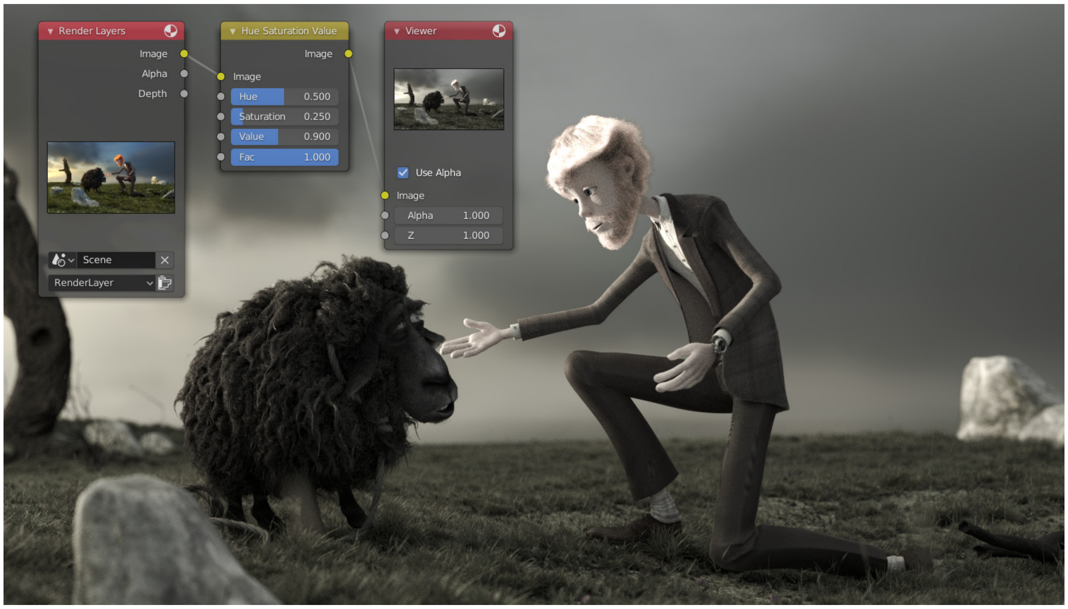
Grayscale images have no hue

Trying to change the Hue or Saturation of a grayscale image has no effect. You can only brighten or darken it by adjusting the Value. To add color, use the Mix node instead.

Changing the effect over time

The different values can be animated using a *Time Curve* node or by setting keyframes.

HSV Example


Render Layers
Image
Alpha
Depth
Scene
RenderLayer
Hue Saturation Value
Image
Image
Viewer
Image

Hue 0.500

Saturation 0.250

Value 0.900

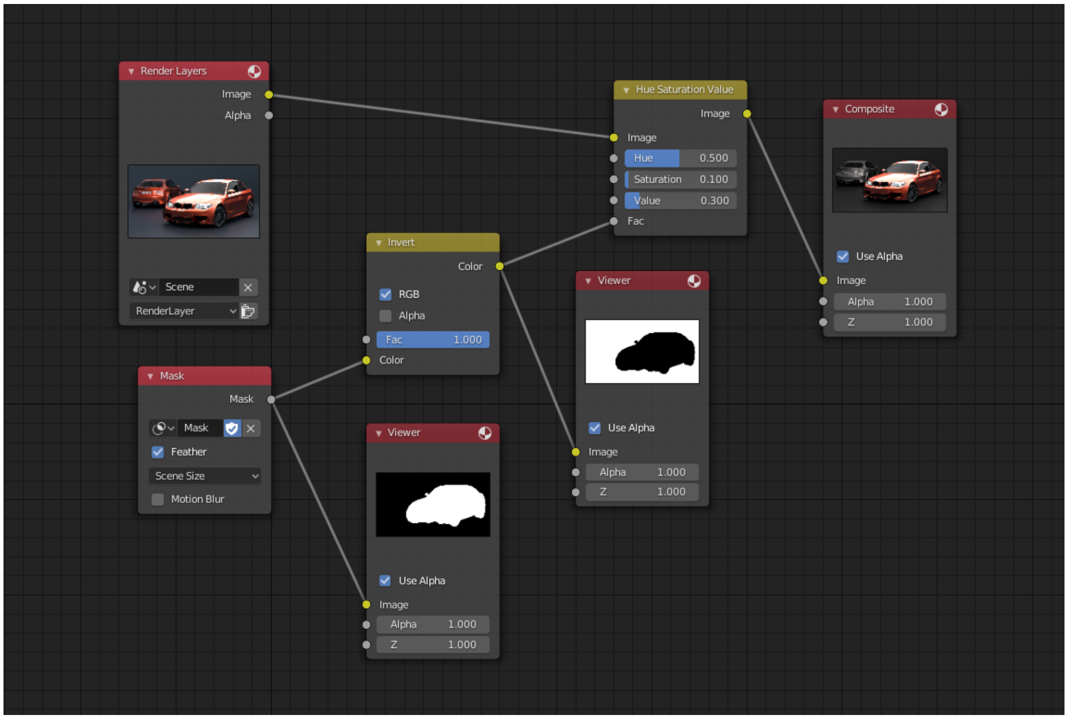
Fac 1.000

☑ Use Alpha

Alpha 1.000

Z 1.000

A basic example.

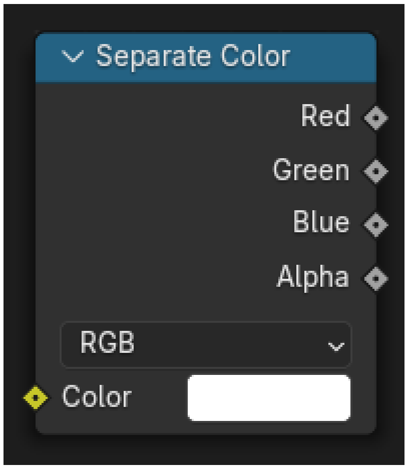

Render Layers
Image
Alpha
Scene
RenderLayer
Mask
Mask
Mask
Feather
Scene Size
Motion Blur
Invert
Color
RGB
Alpha
Color
Viewer
Use Alpha
Image
Hue Saturation Value
Image
Image
Fac
Viewer
Use Alpha
Image
Composite
Use Alpha
Image

Hue 0.500
Saturation 0.100
Value 0.300
Fac 1.000
Alpha 1.000
Z 1.000

An example of using the Factor input for masking.

Separate Color Node

Splits an image into its channels, based on a particular Color Model.


Separate Color
Red
Green
Blue
Alpha
RGB
Color

Inputs

Color
: Standard color input.

Properties

Mode
: The color model to output.

RGB::	Red, Green, Blue.
HSV::	Hue, Saturation, Value.
HSL::	Hue, Saturation, Lightness.

Outputs

The outputs of this node depend on the Mode property (see above).

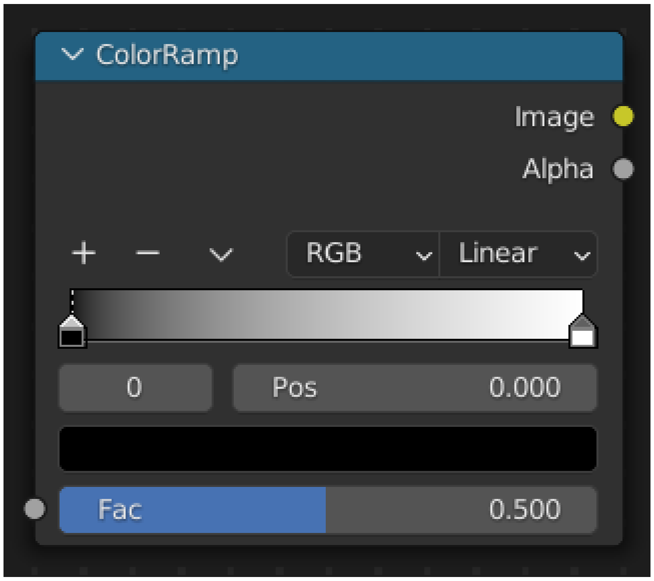
Alpha
: The opacity value.

Converter Nodes

- Color Ramp Node
- Distance Node
- Math Node
- RGB to BW Node
- Value to Normal Node

Color Ramp Node

The Color Ramp Node is used for mapping values to colors using a gradient.


ColorRamp
Image
Alpha
RGB
Linear
0
Pos
0.000
Fac
0.500

Inputs

Factor
: The value to map. 0.0 results in the leftmost color, while 1.0 results in the rightmost.

Properties

Color Ramp
: See [Color Ramp Widget](#).

Outputs

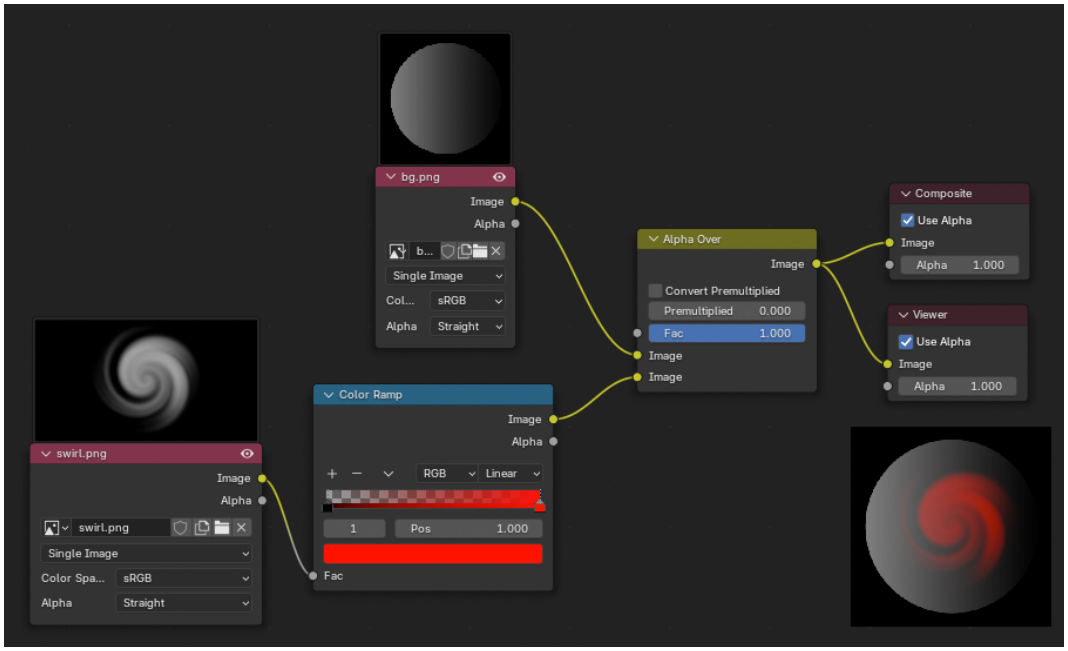
Image/Color
: Standard color output.

Alpha
: Standard alpha output.

Examples

Creating an Alpha Mask

An often overlooked use case of the Color Ramp is to turn a black-and-white image into a colored image with transparency.


bg.png
Image
Alpha
b...
swirl.png
Image
Alpha
swirl.png
Color Ramp
Image
Alpha
Fac
Alpha Over
Image
Image
Image
Composite
Image
Viewer
Image

bg.png: Single Image, Col... sRGB, Alpha Straight

swirl.png: Single Image, Color Spa... sRGB, Alpha Straight

Color Ramp: RGB, Linear, 1, Pos 1.000

Alpha Over: ☐ Convert Premultiplied, Premultiplied 0.000, Fac 1.000

Composite: ☑ Use Alpha, Alpha 1.000

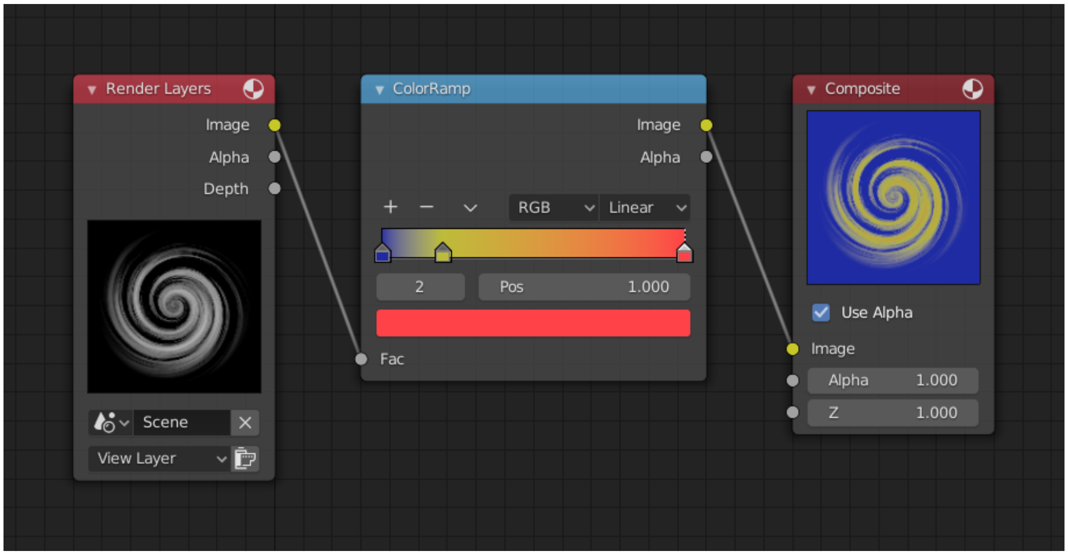
Viewer: ☑ Use Alpha, Alpha 1.000

In the example above, a black-and-white swirl image, which is lacking an alpha channel, is fed into the Color Ramp node as a *Factor*.

The Color Ramp node is set to a purely transparent color on the left end of the gradient, and a fully red color on the right. As you can see in the Viewer node, the Color Ramp node outputs an image that is transparent where the input is black, and opaque where the input is white.

Colorizing an Image

In this example, multiple colors are added to the color gradient, converting a black-and-white image into a flaming swirl.

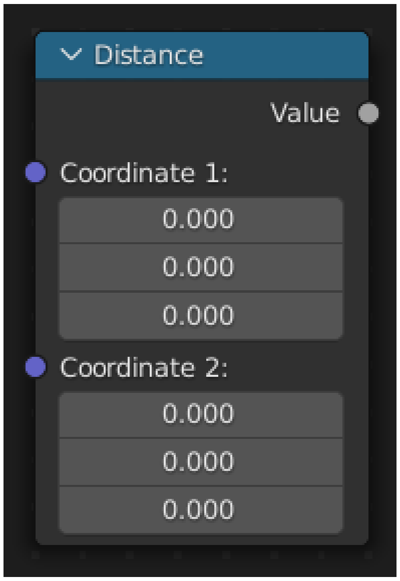

Render Layers
Image
Alpha
Depth
Scene
View Layer
ColorRamp
Image
Alpha
+
−
Fac
Composite
Image

RGB
Linear
2
Pos 1.000
☑ Use Alpha
Alpha 1.000
Z 1.000

The shades of gray in the input image are mapped to three colors: blue, yellow, and red, all fully opaque. Where the image is black, the Color Ramp substitutes blue (the first color stop). Where it is some shade of gray, the Color Ramp outputs a corresponding color from the gradient (bluish, yellow, to reddish). Where the image is fully white, the Color Ramp outputs red.

Distance Node

Computes the distance between two 3D coordinates.


Distance
Value
Coordinate 1:
0.000
0.000
0.000
Coordinate 2:
0.000
0.000
0.000

Inputs

Coordinate 1
    First coordinate point.

Coordinate 2
    Second coordinate point.

Properties

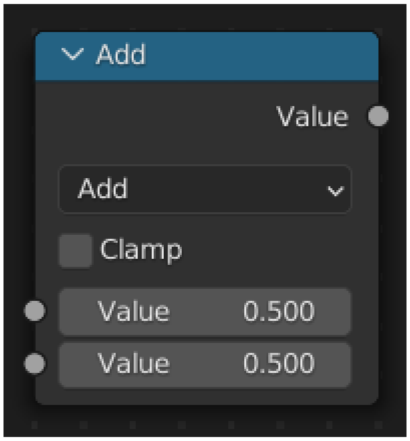
This node has no properties.

Outputs

Value
    Calculated distance.

Math Node

The *Math Node* performs math operations.



Inputs

The inputs of the node are dynamic. Some inputs are only available for certain operations. For instance, the *Addend* input is only available for the *Multiply Add* operator.

Value
    Input Value. Trigonometric functions read this value as radians.

Addend
    Input Addend.

Base
    Input Base.

Exponent
    Input Exponent.

Epsilon
    Input Epsilon.

Distance

Input Distance.

Min
Input Minimum.

Max
Input Maximum.

Increment
Input Increment.

Scale
Input Scale.

Degrees
Input Degrees.

Radians
Input Radians.

Properties

Operation
The mathematical operator to be applied to the input values:

Functions

Add::	The sum of the two values.
Subtract::	The difference between the two values.
Multiply::	The product of the two values.
Divide::	The division of the first value by the second value.
Multiply Add::	The sum of the product of the two values with *Addend*.
Power::	The *Base* raised to the power of *Exponent*.
Logarithm::	The log of the value with a *Base* as its base.
Square Root::	The square root of the value.
Inverse Square Root::	

One divided by the square root of the value.

Absolute:: The input value is read without regard to its sign. This turns negative values into positive values.

Exponent:: Raises Euler’s number to the power of the value.

Comparison

Minimum:: Outputs the smallest of the input values.

Maximum:: Outputs the largest of two input values.

Less Than:: Outputs 1.0 if the first value is smaller than the second value. Otherwise the output is 0.0.

Greater Than:: Outputs 1.0 if the first value is larger than the second value. Otherwise the output is 0.0.

Sign:: Extracts the sign of the input value. All positive numbers will output 1.0. All negative numbers will output -1.0. And 0.0 will output 0.0.

Compare:: Outputs 1.0 if the difference between the two input values is less than or equal to *Epsilon*.

Smooth Minimum:: Smooth Minimum.

Smooth Maximum:: Smooth Maximum.

Rounding

Round:: Rounds the input value to the nearest integer.

Floor:: Rounds the input value down to the nearest integer.

Ceil:: Rounds the input value up to the nearest integer.

Truncate:: Outputs the integer part of the *value*.

Fraction:: Returns the fractional part of the *value*.

Truncated Modulo:: Outputs the remainder once the first value is divided by the second value.

Floored Modulo:: Returns the positive remainder of a division operation.

Wrap::

Outputs a value between *Min* and *Max* based on the absolute difference between the input value and the nearest integer multiple of *Max* less than the value.

Snap:: Rounds the input value down to the nearest integer multiple of *Increment*.

Ping-pong:: Bounces back and forth between 0.0 and the *Scale* as the input value increases.

Trigonometric

Sine:: The Sine of the input value.

Cosine:: The Cosine of the input value.

Tangent:: The Tangent of the input value.

Arcsine:: The Arcsine of the input value.

Arccosine:: The Arccosine of the input value.

Arctangent:: The Arctangent of the input value.

Arctan2:: Outputs the Inverse Tangent of the first value divided by the second value measured in radians.

Hyperbolic Sine:: The Hyperbolic Sine of the input value.

Hyperbolic Cosine:: The Hyperbolic Cosine of the input value.

Hyperbolic Tangent:: The Hyperbolic Tangent of the input value.

Conversion

To Radians:: Converts the input from degrees to radians.

To Degrees:: Converts the input from radians to degrees.

Clamp

Limits the output to the range (0.0 to 1.0). See Clamp.

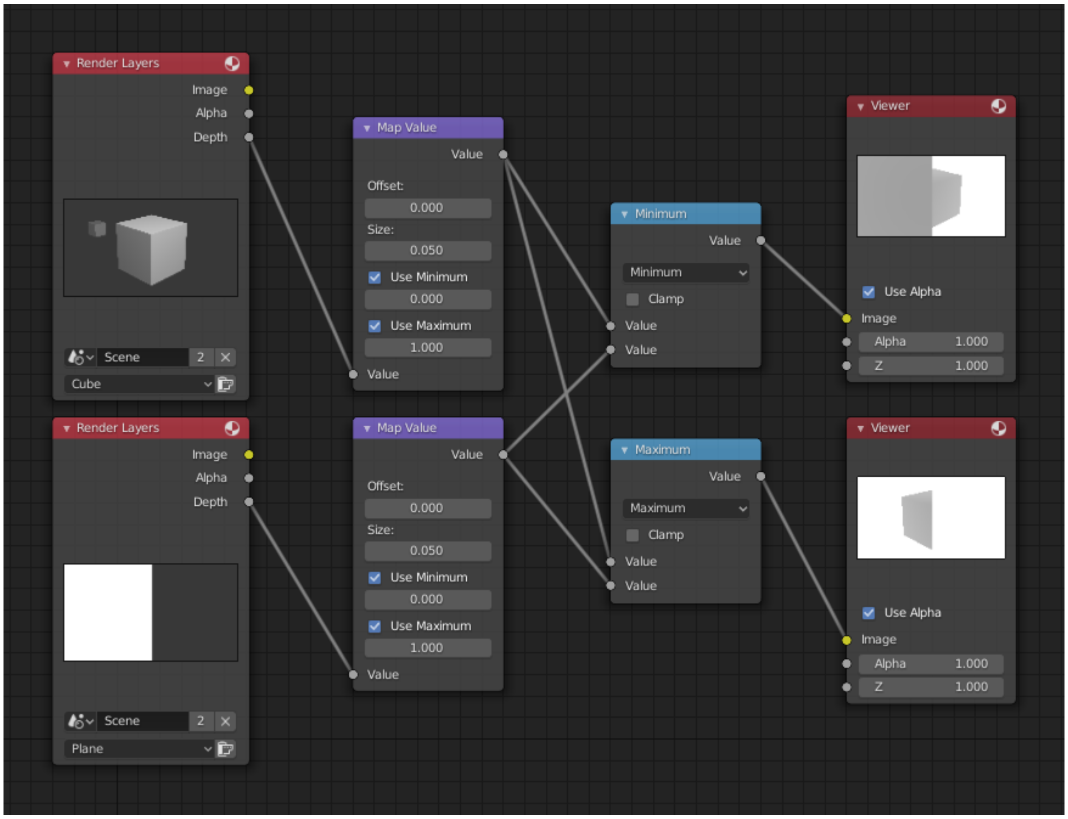
Outputs

Value

Numerical value output.

Examples

Manual Z-Mask


Render Layers
Image
Alpha
Depth
Scene
2
Cube
Render Layers
Image
Alpha
Depth
Scene
2
Plane
Map Value
Value
Value
Map Value
Value
Value
Minimum
Value
Minimum
Clamp
Value
Value
Maximum
Value
Maximum
Clamp
Value
Value
Viewer
Use Alpha
Image
Viewer
Use Alpha
Image

Offset: 0.000
Size: 0.050
☑ Use Minimum 0.000
☑ Use Maximum 1.000

Offset: 0.000
Size: 0.050
☑ Use Minimum 0.000
☑ Use Maximum 1.000

☐ Clamp

☐ Clamp

☑ Use Alpha
Alpha 1.000
Z 1.000

☑ Use Alpha
Alpha 1.000
Z 1.000

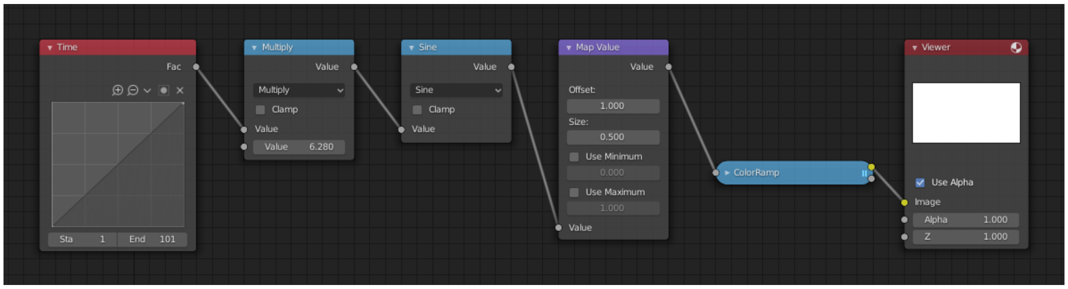
Minimum and maximum function example.

The top *Render Layers* node has a cube that is about 10 units from the camera. The bottom *Render Layers* node has a plane that covers the left half of the view and is 7 units from the camera. Both are fed through their respective *Map Value* nodes to multiply the depth value by 0.05 and clamp it to [0.0, 1.0], bringing it into a suitable range for displaying it as a color.

The Minimum node selects the smallest of the two depth values at each pixel. In the left half, it chooses the plane (because it’s closer than the cube), and in the right half, it chooses the cube (because it’s closer than the background, which is infinitely far away).

The Maximum node selects the largest of the two depth values at each pixel. In the left half, it chooses the cube (because it’s farther away than the plane), and in the right half, it chooses the background (because it’s farther away than the cube).

Using Sine Function to Pulsate


Time
Fac
Sta 1
End 101
Multiply
Value
Multiply
☐ Clamp
Value
Value 6.280
Sine
Value
Sine
☐ Clamp
Value
Map Value
Value
Offset:
1.000
Size:
0.500
☐ Use Minimum
0.000
☐ Use Maximum
1.000
Value
ColorRamp
Viewer
☑ Use Alpha
Image
Alpha 1.000
Z 1.000

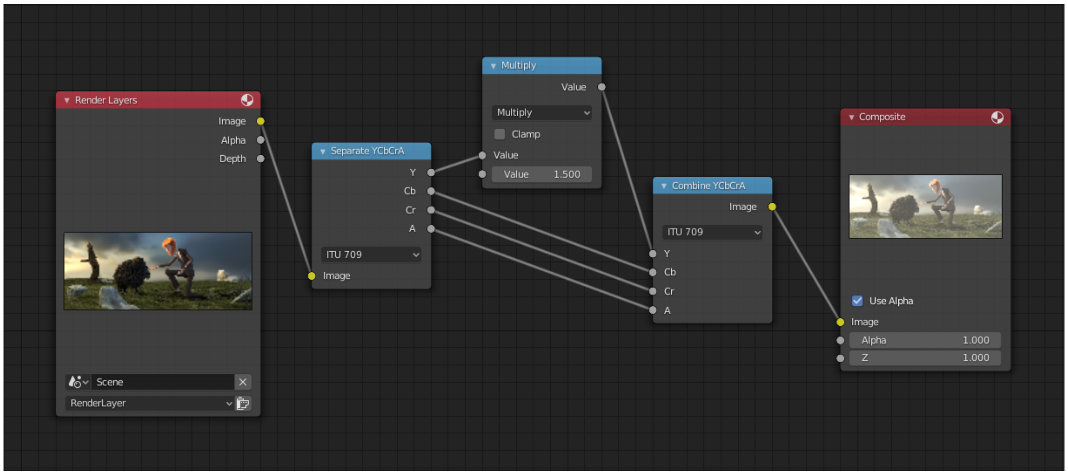
Using sine function example.

This example has a *Time* node putting out a linear sequence from 0 to 1 over the course of 101 frames. At frame 25, the output value is 0.25. That value is multiplied by 2 × pi (6.28) and converted to 1.0 by the Sine function, since \(sin(2 × pi/ 4) = sin(pi/ 2) = +1.0\).

Since the sine function can output values between (-1.0 to 1.0), the *Map Value* node scales that to 0.0 to 1.0 by taking the input (-1 to 1), adding 1 (making 0 to 2), and multiplying the result by 0.5 (thus scaling the output between 0 to 1). The default *Color Ramp* converts those values to a gray-scale. Thus, medium gray corresponds to a 0.0 output by the sine, black to -1.0, and white to 1.0. As you can see, \(sin(pi/ 2) = 1.0\). Like having your own visual color calculator! Animating this node setup provides a smooth cyclic sequence through the range of grays.

Use this function to vary, for example, the alpha channel of an image to produce a fading in/out effect. Alter the Z channel to move a scene in/out of focus. Alter a color channel value to make a color “pulse”.

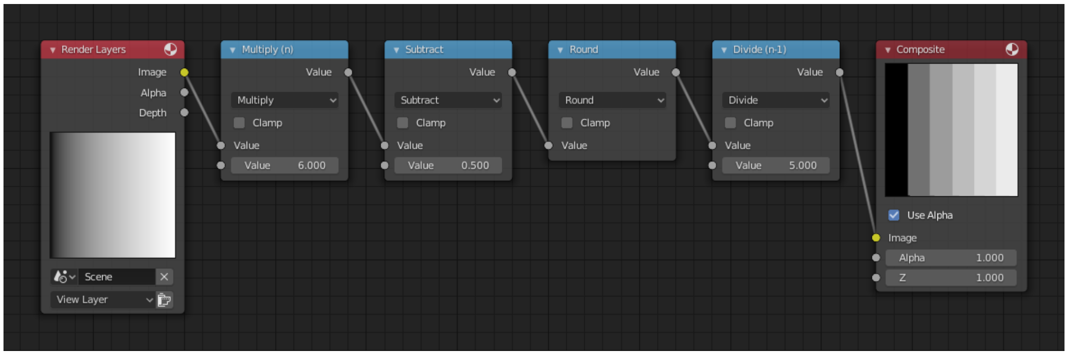
Brightening (Scaling) a Channel


Render Layers
Image
Alpha
Depth
Scene
RenderLayer
Separate YCbCrA
Y
Cb
Cr
A
ITU 709
Image
Multiply
Value
Multiply
Clamp
Value
Value 1.500
Combine YCbCrA
Image
ITU 709
Y
Cb
Cr
A
Composite
Use Alpha
Image
Alpha 1.000
Z 1.000

Scaling a channel example.

This example has a *Math (Multiply)* node increasing the luminance channel (Y) of the image to make it brighter. Note that you should use a *Map Value node* with min() and max() enabled to clamp the output to valid values. With this approach, you could use a logarithmic function to make a high dynamic range image. For this particular example, there is also a *Brightness/Contrast node* that might give simpler control over brightness.

Restrict Color Selection (Posterization)


Render Layers
Image
Alpha
Depth
Scene
View Layer
Multiply (n)
Value
Multiply
Clamp
Value
Value 6.000
Subtract
Value
Subtract
Clamp
Value
Value 0.500
Round
Value
Round
Clamp
Value
Divide (n-1)
Value
Divide
Clamp
Value
Value 5.000
Composite
Use Alpha
Image
Alpha 1.000
Z 1.000

Posterization example.

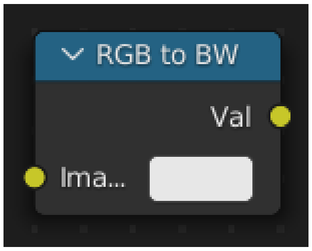
In this example, we restrict the color values to be one of the six values: 0, 0.2, 0.4, 0.6, 0.8, 1.

To split up a continuous range of values between 0 and 1 to certain set of values, the following function is used: \(round(x × n - 0.5) / (n - 1)\), where “n” is the number of possible output values, and “x” is the input pixel color. Read more about this function.

To implement this function in Blender, consider the node setup above. We string the Math nodes into a function that takes each color (values from 0 to 1), multiplies it up by six, the desired number of divisions (values become from 0 to 6), offsets it by 0.5 (-0.5 to 5.5), rounds the value to the nearest whole number (produces 0, 1, 2, 3, 4, 5), and then divides the image pixel color by five (0.0, 0.2, 0.4, 0.6, 0.8, 1.0).

In the case of a color image, you need to split it into separate RGB channels using *Separate/Combine Color* nodes and perform this operation on each channel independently.

RGB to BW Node



The *RGB to BW Node* makes a color image black-and-white by outputting its luminance.

Note

You can directly connect Color sockets to Value sockets in node graphs, which also converts the image to black-and-white. As such, this node is not always necessary.

Inputs

Image
    Color image input.

Properties

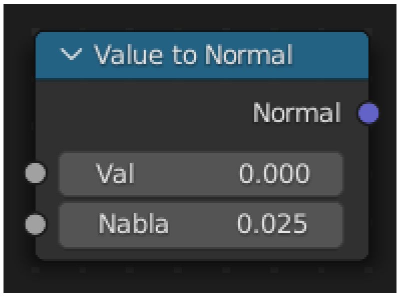
This node has no properties.

Outputs

Value
    Grayscale value output.

Value to Normal Node

Computes a normal map.


Value to Normal
Normal
Val 0.000
Nabla 0.025

Inputs

Val
: The heightmap to compute the normal map from.

Nabla
: Size of derivative offset used for calculating normals.

Properties

This node has no properties.

Outputs

Normal
: Standard normal output.

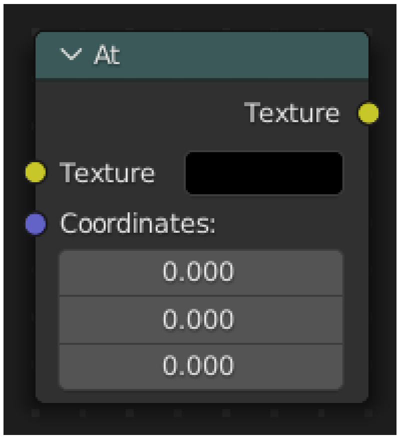
Distort Nodes

These nodes allow you to change the mapping of a texture.

- At Node
- Rotate Node
- Scale Node
- Translate Node

At Node

Returns the color of a texture at the specified coordinates.


At
Texture
Texture
Coordinates:
0.000
0.000
0.000

Inputs

Texture

Standard color input.

Coordinates

The point at which to sample the color. For images, the space is between -1 and 1 for X and Y. If the coordinates are not spatially varying, the node will return a single color.

Properties

This node has no properties.

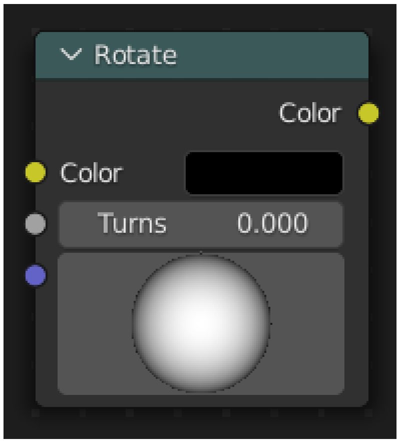
Outputs

Texture

Standard color output.

Rotate Node

Rotate the texture coordinates of an image or texture.



Inputs

Color
: Standard color input.

Turns
: The number of times to rotate the coordinates 360 degrees about the specified axis.

Axis
: The axis to rotate the mapping about.

Properties

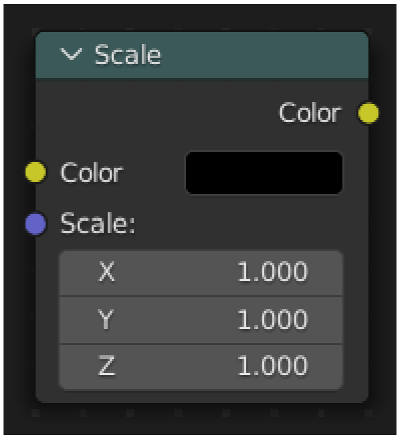
This node has no properties.

Outputs

Color
: Standard color output.

Scale Node

Scale the texture coordinates of an image or texture.



X 1.000
Y 1.000
Z 1.000

Inputs

Color
: Standard color input.

Scale
: The amount to scale the coordinates in each of the three axes.

Properties

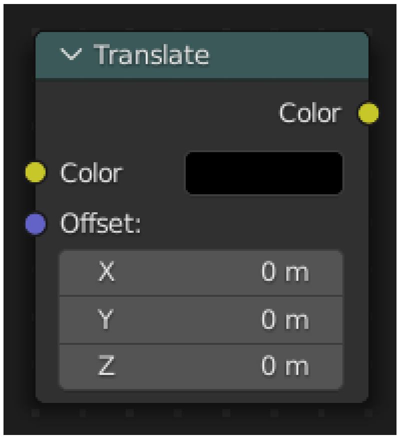
This node has no properties.

Outputs

Color
: Standard color output.

Translate Node

Translate the texture coordinates of an image or texture.


Translate
Color
Color
Offset:

X 0 m
Y 0 m
Z 0 m

Inputs

Color
: Standard color input.

Offset
: The amount to offset the coordinates in each of the three axes.

Properties

This node has no properties.

Outputs

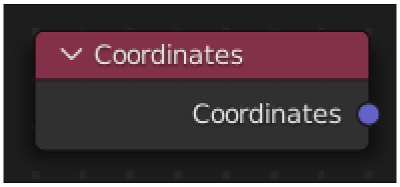
Color
: Standard color output.

Input Nodes

Input nodes provide input data for other nodes.

- Coordinates Node
- Image Node
- Texture Node
- Time Curve Node

Coordinates Node


Coordinates
Coordinates

Inputs

This node has no inputs.

Properties

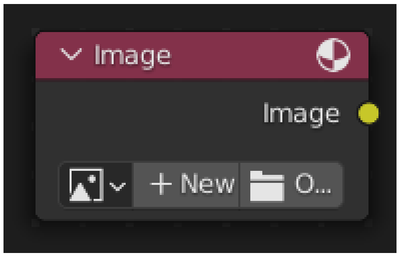
This node has no properties.

Outputs

Coordinates
: The Coordinates node outputs the local geometry coordinates, relative to the bounding box.

Image Node

The Image node can be used to load an external image.



Inputs

This node has no inputs.

Properties

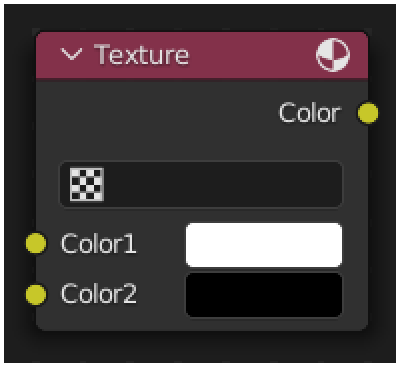
Image
    See Data-Block Menu.

Outputs

Color
    Standard color output.

Texture Node

The Texture node loads another node-based or non-node-based texture.



Inputs

These two colors can be used to remap a grayscale texture.

Color 1
White Level.

Color 2
Black Level.

Properties

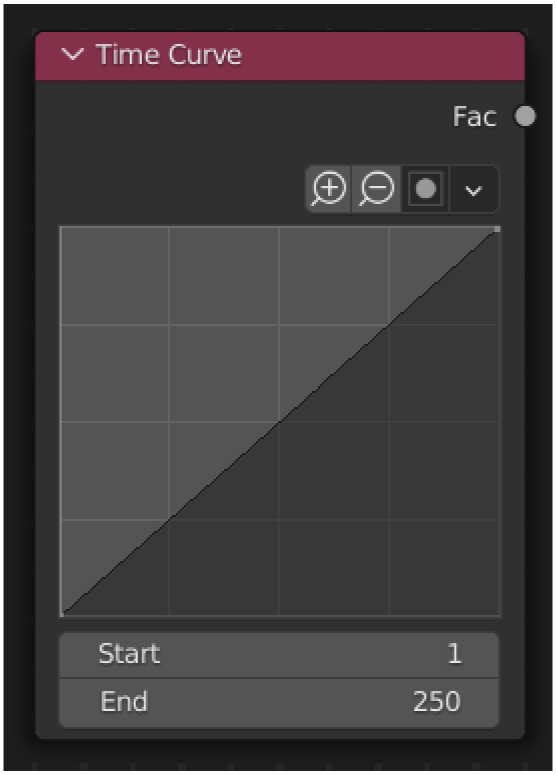
Texture
The texture to load – either from the current blend-file, or from a linked one.

Outputs

Color
Standard color output.

Time Curve Node

The *Time Curve node* generates a factor value (from 0.0 to 1.0) between the scene start and end time, using a curve mapping.



Start 1

End 250

Inputs

This node has no inputs.

Properties

Curve

The Y value defined by the curve is the factor output. For the curve controls, see [Curve widget](#).

Tip

Flipping the curve around reverses the time input, but doing so is easily overlooked in the node setup.

Start, End

Start frame and End frame of the range of time specifying the values the output should last. This range becomes the X axis of the graph. The time input could be reversed by specifying a start frame greater than the end frame.

Outputs

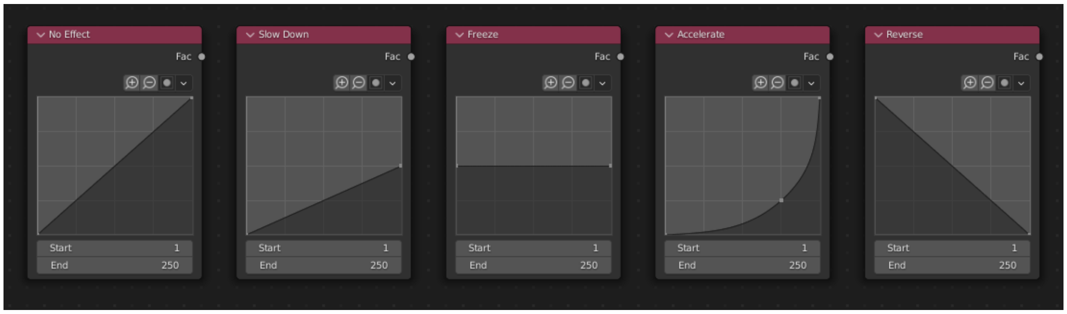
Factor

The Y value of the curve at the current frame.

Hint

The Map Value node can be used to map the output to a more appropriate value. With some curves, it is possible that the Time Curve node may output a number larger than one or less than zero. To be safe, use the Min/Max clamping function of the Map Value node to limit output.

Example



Start 1
End 250

Start 1
End 250

Start 1
End 250

Start 1
End 250

Start 1
End 250

Time controls from left to right: no effect, slow down, freeze, accelerate, reverse.

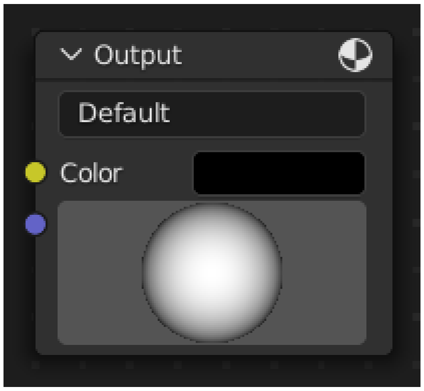
Output Nodes

These nodes serve as outputs for node-based textures.

- Output Node
- Viewer Node

Output Node

This node receives the result of the node-based texture.



Inputs

Color
  The color data that the texture renders.

Properties

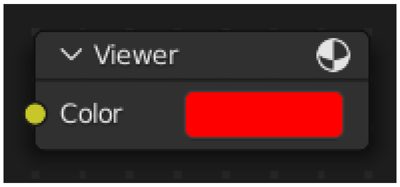
Output Name
  The name of the output. (Originally, it was possible for textures to have multiple outputs with different names.)

Outputs

This node has no outputs.

Viewer Node

The Viewer node can be used to preview the results of a node.



Inputs

Color
    Standard color input.

Properties

This node has no properties.

Outputs

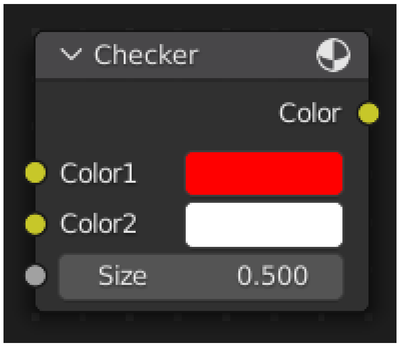
This node has no outputs.

Pattern Nodes

- Checker Node
- Bricks Node

Checker Node

The Checker node creates a checkerboard pattern.


Checker
Color
Color1
Color2

Size 0.500

Inputs

Color 1, Color 2
The colors of the squares.

Size
The scale of the checker pattern.

Properties

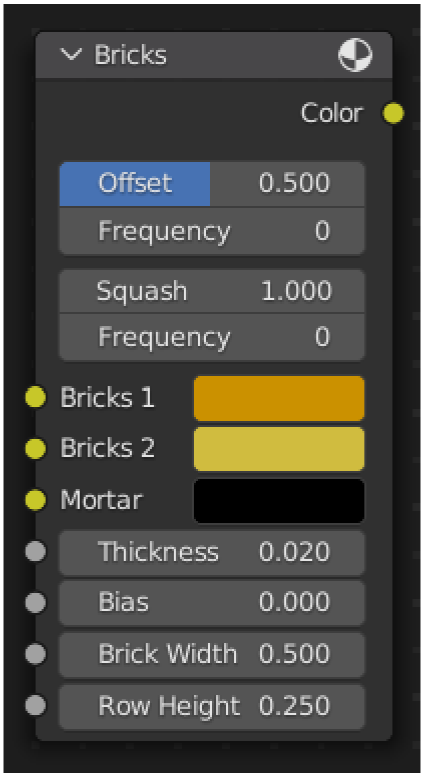
This node has no properties.

Outputs

Color
Standard color output.

Bricks Node

The Bricks node creates a brick-like pattern.



Offset 0.500
Frequency 0
Squash 1.000
Frequency 0
Thickness 0.020
Bias 0.000
Brick Width 0.500
Row Height 0.250

Inputs

Bricks 1, Bricks 2
: Sets the color range of the bricks. Brick colors are chosen randomly between these two colors.

Mortar
: Sets the mortar color, in between the bricks.

Thickness
: Sets the thickness of the mortar.

Bias
: The bias of randomly chosen colors, between (-1 to 1). -1 Makes all bricks Color 1, and a value of 1 makes them all Color 2.

Brick Width
Sets the horizontal size of all the bricks.

Row Height
Sets the vertical size of all the bricks.

Properties

Offset
The relative offset of the next row of bricks.

Frequency
Offset every N rows. The brick pattern offset repeats every N rows.

Squash
Scales the bricks in every N rows by this amount.

Frequency
Squash every N rows.

Outputs

Color
Standard color output.

Texture Nodes

These nodes generate procedural textures, and function just like their non-node-based counterparts.

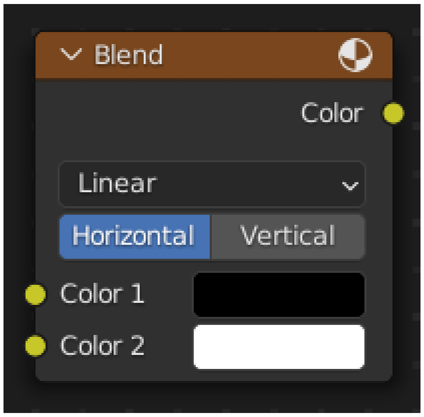
Common Options

Color 1/Color 2

Remaps the procedural texture with these colors. These do not function in the Magic node.

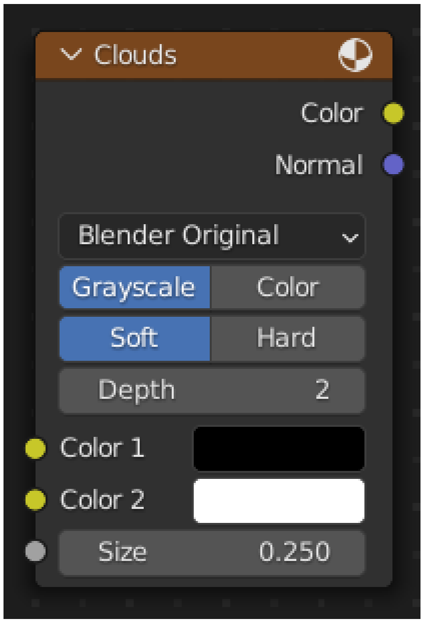
- Blend Node
- Clouds Node
- Distorted Noise Node
- Magic Node
- Marble Node
- Musgrave Node
- Noise Node
- Stucci Node
- Voronoi Node
- Wood Node

Blend Node


Blend
Color
Linear
Horizontal
Vertical
Color 1
Color 2

See Here.

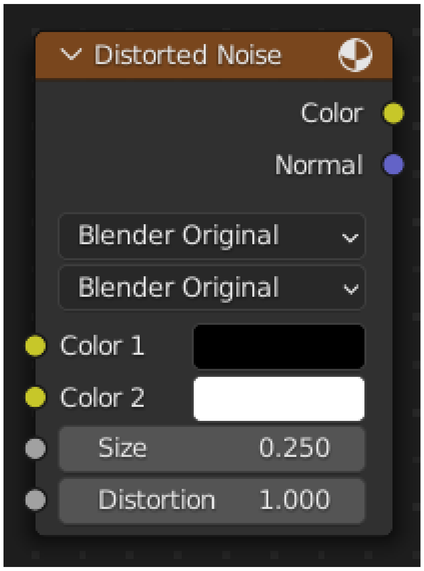
Clouds Node


Clouds
Color
Normal
Color
Hard
Color 1
Color 2

Blender Original
Grayscale
Soft
Depth 2
Size 0.250

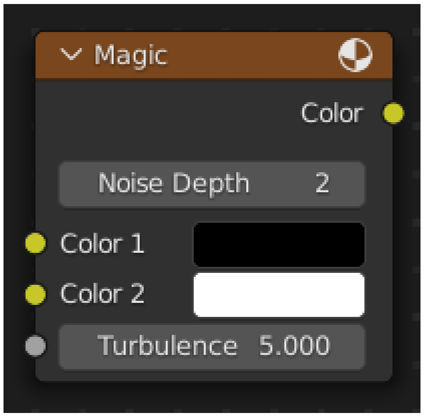
See Here.

Distorted Noise Node


Distorted Noise
Color
Normal
Blender Original
Blender Original
Color 1
Color 2
Size 0.250
Distortion 1.000

See Here.

Magic Node

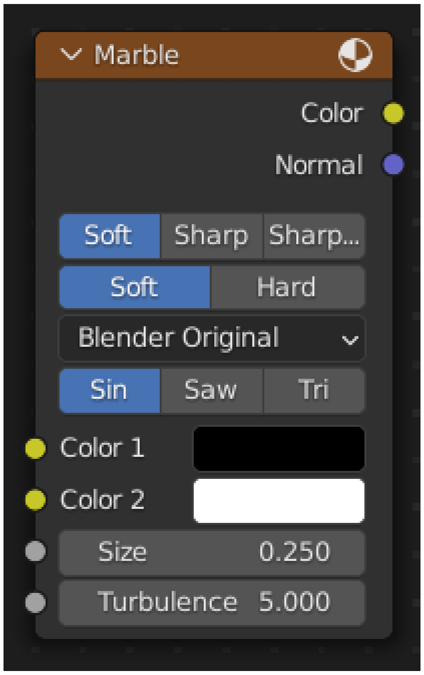

Magic
Color
Color 1
Color 2

Noise Depth 2

Turbulence 5.000

See Here.

Marble Node

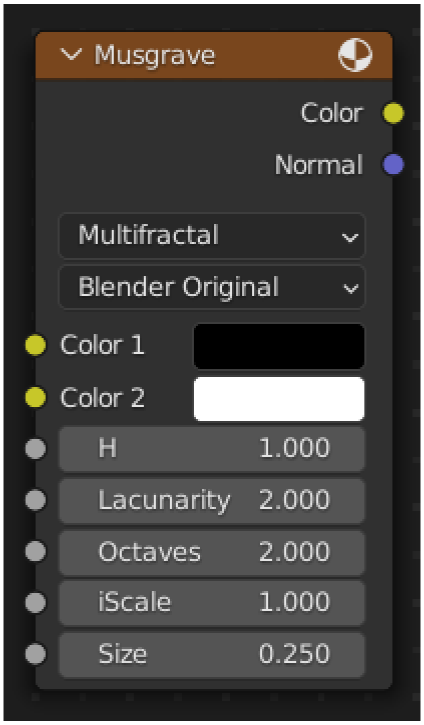

Marble
Color
Normal
Soft
Sharp
Sharp...
Soft
Hard
Blender Original
Sin
Saw
Tri
Color 1
Color 2

Size 0.250

Turbulence 5.000

See Here.

Musgrave Node

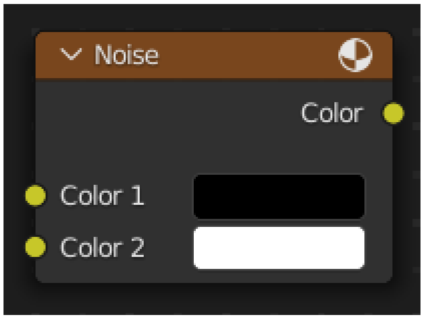


Musgrave
Color
Normal

Multifractal
Blender Original
Color 1
Color 2
H 1.000
Lacunarity 2.000
Octaves 2.000
iScale 1.000
Size 0.250

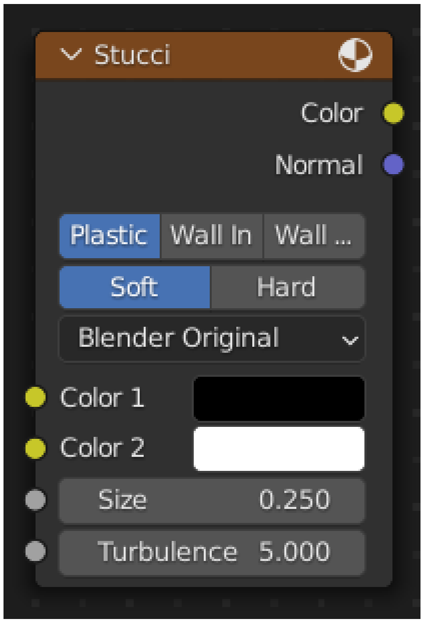
See Here.

Noise Node


Noise
Color
Color 1
Color 2

See Here.

Stucci Node

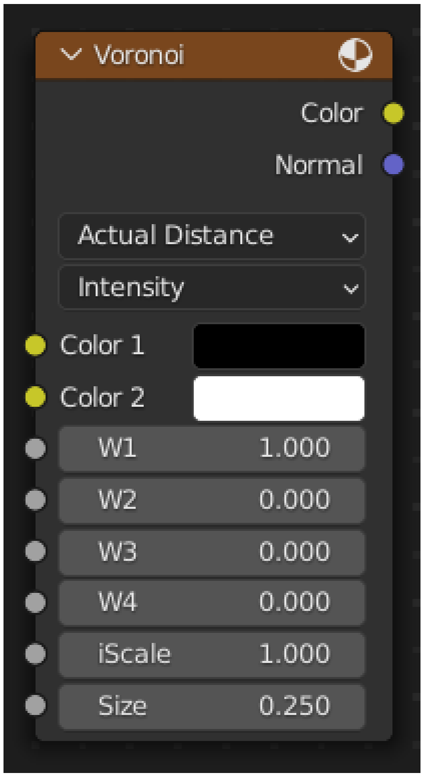

Stucci
Color
Normal
Plastic
Wall In
Wall ...
Soft
Hard
Blender Original
Color 1
Color 2

Size 0.250

Turbulence 5.000

See Here.

Voronoi Node


Voronoi
Color
Normal
Color 1
Color 2

Actual Distance

Intensity

W1 1.000

W2 0.000

W3 0.000

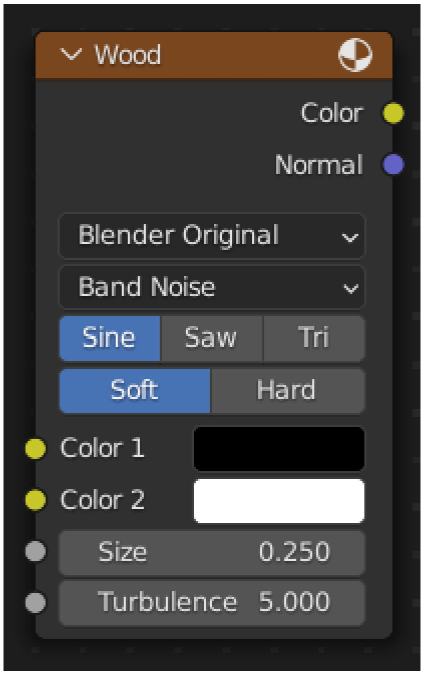
W4 0.000

iScale 1.000

Size 0.250

See Here.

Wood Node


Wood
Color
Normal
Saw
Tri
Hard
Color 1
Color 2

Blender Original
Band Noise
Sine
Soft
Size 0.250
Turbulence 5.000

See Here.

Group

A Group Node combines a set of nodes into a single one, and selectively exposes inputs and outputs of those nodes.

Group nodes can simplify a node tree by hiding away complexity and reusing functionality.

Group Input

Exposes the inputs of the node group. You can have multiple of these nodes in your tree to keep it clean, bringing in each input right where you need it (rather than dragging long links all across your graph).

The input slots can be edited in the *Group* tab of the *Sidebar*.

Group Output

Receives the outputs of the node group. You can have multiple of these nodes in your tree to keep it clean, outputting each result right where it's produced (rather than dragging long links all across your graph).

The output slots can be edited in the *Group* tab of the *Sidebar*.

Node Groups

This section lists all the node groups, both those in the current blend-file and those Linked or Appended from another blend-file.

Geometry Node Editor

The Geometry Node editor is used to edit Node Groups which are used by the Geometry Node Modifier. Such a node group can define many operations to modify an object's geometry.

A list of all Geometry Nodes is available in the modeling section.

Interface

Header

Geometry Nodes Type

Geometry Nodes can have multiple contexts depending on the intended function of the node group. Changing the context adjusts the user interface to best fit the needs of the selected context.

Modifier::	Used to create node groups that will be used by the Geometry Nodes Modifier.
Tool::	Used to create node groups that will be used to create Node-Based Tools.

View

Standard view menu.

Select

Menu for Selecting Nodes.

Add

Menu for adding new Geometry Nodes.

Node

Menu for Editing Nodes.

Geometry Node Group

Data-Block Menu for creating and selecting node groups.

Pin (pin icon)

The pin button will keep the current node group selection fixed, instead of using the Active Modifier. When a node group is pinned, it will remain visible in the Geometry Node editor even when another object or modifier is selected elsewhere.

Parent Node Tree

Jumps up a node group level. See Edit Group for details.

Snapping

Snapping options. See Arranging Nodes for details.

Overlays

See Overlays.

Toolbar

Select

See Selecting Nodes.

Annotate

See Annotations.

Links Cut

See Cut Links.

Sidebar

Node

This tab gives access to the active node’s properties.

Tool

This tab gives access to the active tool’s settings.

View

This tab allows managing annotations.

Group

This tab allows you to edit the current node group’s inputs and outputs.

Tip

In the Geometry Node Modifier, you can specify values for the root node group’s inputs, as well as select destination Attributes for its outputs.

Tool Context

These popover menus are displayed in the header when the tool context is enabled. These properties determine where the tool is available in the user interface.

See Supported Modes & Data-Types for more information.

Types

The Object Types the tool supports.

Mesh
    The node tree supports Mesh Objects.

Curves
    The node tree supports Curve Objects.

Modes

The Object Modes the tool supports.

Object Mode
The node group can be used in Object mode.

Edit Mode
The node group can be used in edit mode.

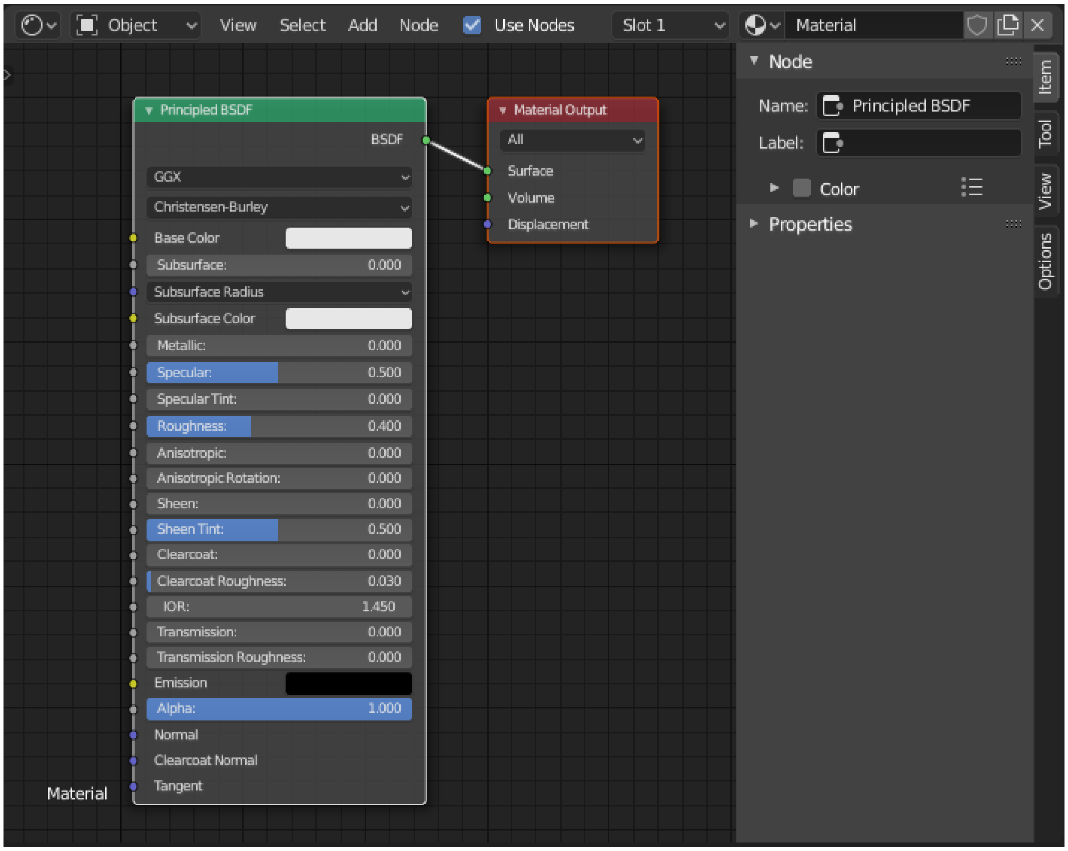
Sculpt Mode
The node group can be used in Sculpt Mode.

Options

Wait for Click
Wait for a mouse click input (`LMB`) before running the operator from a menu. This is useful for the Mouse Position Node.

Shader Editor

The Shader Editor is used to edit materials which are used for rendering. Materials used by Cycles and EEVEE are defined using a node tree. Therefore, the main window of the Shader editor is a node editor.



Object
View
Select
Add
Node
☑ Use Nodes
Slot 1
Material
Node
Item
Tool
View
Options
Color
Properties
Principled BSDF
BSDF
Material Output
Surface
Volume
Displacement
Material

Name: Principled BSDF
Label:

All

GGX
Christensen-Burley
Base Color
Subsurface: 0.000
Subsurface Radius
Subsurface Color
Metallic: 0.000
Specular: 0.500
Specular Tint: 0.000
Roughness: 0.400
Anisotropic: 0.000
Anisotropic Rotation: 0.000
Sheen: 0.000
Sheen Tint: 0.500
Clearcoat: 0.000
Clearcoat Roughness: 0.030
IOR: 1.450
Transmission: 0.000
Transmission Roughness: 0.000
Emission
Alpha: 1.000
Normal
Clearcoat Normal
Tangent

Shader Editor with the default material node tree.

A list of all shader nodes is available in the rendering section.

Header

Use Nodes

The Use Nodes setting is mostly a legacy setting and should always be checked for materials.

Slot

The *Slot* menu can be used to select the active material slot on the active object. The material selector to the right of it can change the material that is in the selected slot.

Pin (pin icon)

The pin button will keep the current material selection fixed. When a material is pinned, it will remain visible in the Shader editor even when another object or material is selected elsewhere.

Sidebar

Options

The Options panel in the Sidebar region contains the same settings that are also available in the Material tab in the Properties. They differ depending on the selected render engine. The settings are duplicated to make it possible to edit the entire material from the Shader editor.

Video Sequencer

- Introduction
    - Editor Layout
    - View Types
    - Performance

View Types

- Sequencer
    - Introduction
    - Channels
    - Navigating
    - Toolbar
    - Sidebar
    - Display
- Preview
    - Introduction
    - Header
    - Toolbar
    - Sidebar
    - Controls
    - Display
- Sequencer & Preview

Introduction

The Video Sequencer allows you to place images, videos, sounds, and scenes on a timeline and combine them into a new video. This section only describes its UI; to read more about its usage, see the Video Editing section.

Editor Layout

The Video Sequencer is composed of multiple regions. They are described in more detail in the next sections. Figure 1 shows the combined *Sequencer & Preview* view type:

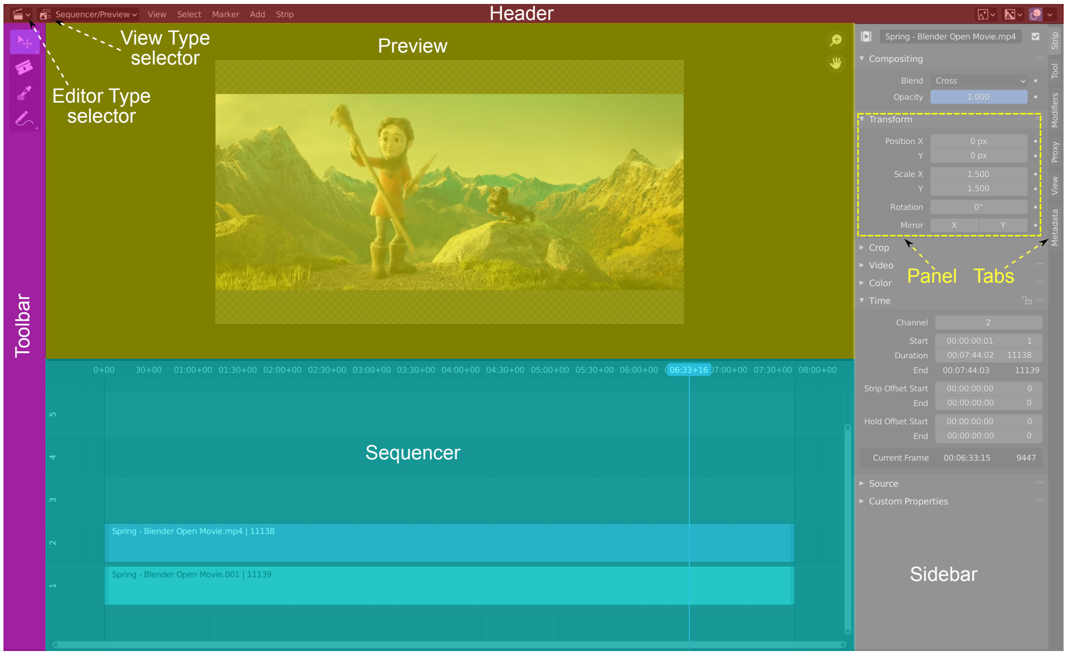

Header
View Type selector
Editor Type selector
Preview
Toolbar
Sequencer
Panel Tabs
Sidebar

Figure 1: The Video Sequencer Editor shown in the Sequencer & Preview view type.

Header
: Contains menus and buttons for interacting with the editor. The header changes slightly depending on the selected view type (see below).

Preview

Shows the output of the Sequencer at the time of the Playhead.

Sequencer

Shows a timeline for managing the montage of strips.

Sidebar

Shows the properties of the active strip. It’s divided into panels and tabs. Toggle on or off with `N`.

Toolbar

Shows a list of tools. Toggle on or off with `T`.

View Types

The Video Sequencer has three view types which can be changed using the View Type selector (see figure 1; top left).

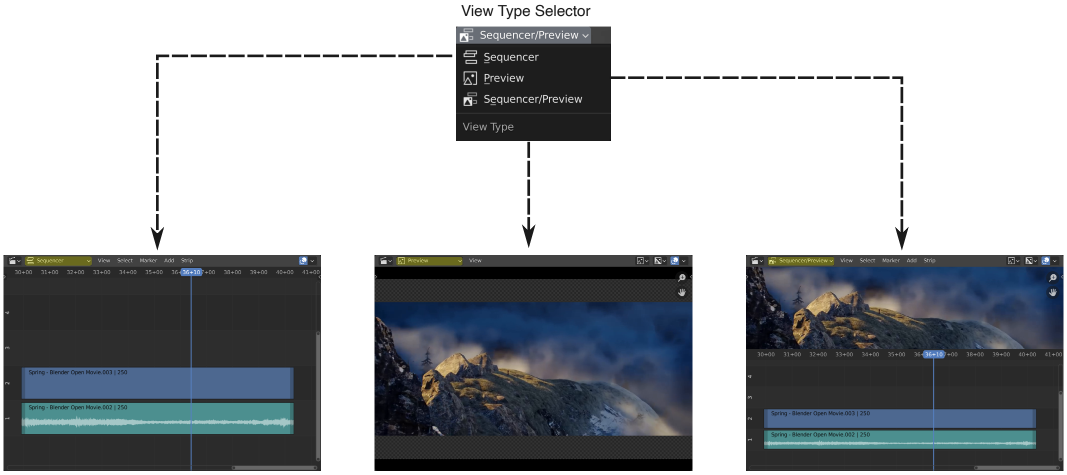

View Type Selector
Sequencer/Preview
Sequencer
Preview
Sequencer/Preview
View Type

Figure 2: Three view types for the Video Sequence Editor

Sequencer

View timeline and strip properties.

Preview

View preview window and preview properties.

Sequencer & Preview
Combined view of preview and timeline and their properties.

Tip

Rather than having one Video Sequencer in the *Sequencer & Preview* mode, it can be more useful to have one in the *Sequencer* mode and another in the *Preview* mode, the reason being that *Sequencer & Preview* lacks most of the *Preview* tools. Blender's default *Video Editing* workspace offers this layout.

Performance

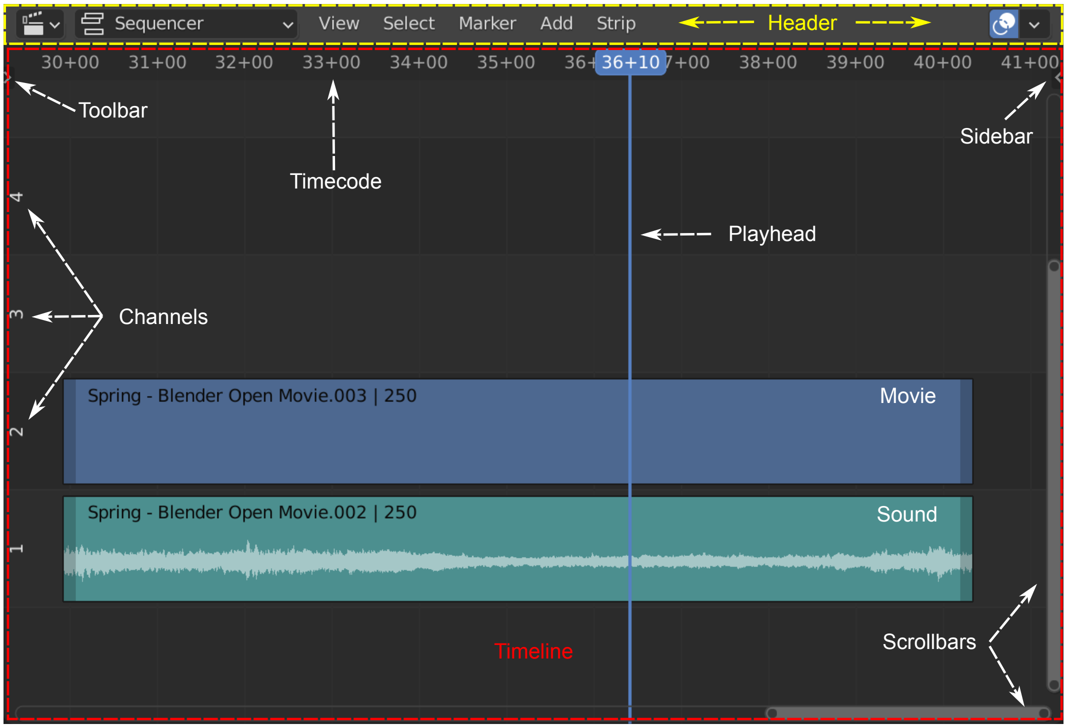
Playback performance can be improved in several ways.

The method with the most impact is to allow the Video Sequencer to cache generated frames. There are two levels of cache: a memory cache, which is enabled by default (and can be enlarged if RAM allows), and a disk cache, which is slower but has more capacity. Both of these can be configured in the Preferences.

Another way to improve performance is by using Strip Proxies. These are copies of source images and videos with a lower resolution and/or quality, making them faster to load than the originals.

Sequencer

The Sequencer view type shows a timeline and allows placing and editing strips.


Sequencer
View
Select
Marker
Add
Strip
Header
30+00
31+00
32+00
33+00
34+00
35+00
36+10
38+00
39+00
40+00
41+00
Toolbar
Timecode
Sidebar
Playhead
Channels
4
3
2
1
Spring - Blender Open Movie.003 | 250
Movie
Spring - Blender Open Movie.002 | 250
Sound
Timeline
Scrollbars

The Sequencer view and its components.

- Introduction
- Channels
    - Channel Region
- Navigating
    - Header
    - Main View
- Toolbar
    - Introduction
    - Blade
- Sidebar
    - Strip

  - Modifiers
  - Cache
  - Proxy
- Display
  - Sequencer Overlays

Introduction

The Sequencer view is where most of the video editing happens. It shows a stack of channels, in which you can create strips.

Channels

A channel is a horizontal track that's similar to a layer in an image editing program: higher channels are displayed in front of lower ones.

Within each channel, you can create one or more strips, which contain either a segment of video content (a rendered scene, an external video file…) or an effect (color blending, blurring…). The X axis represents time, so the further a strip is placed to the right, the later it will play in the final video.

While a channel can contain multiple strips, they can't overlap each other. If you want two strips to play at the same time, you need to place them in different channels.

Channel Region

The Channel region sits on the left side of the editor and contains the channel properties listed below. Its visibility can be toggled with *View ‣ Channels*.

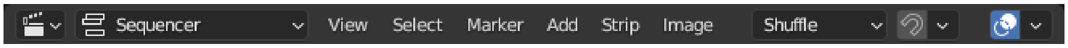
Name
: The name of the channel. Double-click to change.

Mute Channel
: Disable the entire channel so that none of its strips can be seen (or heard) in the final video. Note that you can also mute individual strips.

Lock Channel
: Lock the entire channel to protect all its strips against accidental changes. Note that you can also lock individual strips.

Navigating

Header



Video Sequencer Header.

View Menu

The View menu controls the editor's view settings.

Toolbar `T`
: Show or hide the Toolbar.

Sidebar `N`
: Show or hide the Sidebar.

Tool Settings
: Show or hide the settings for the currently selected tool.

Adjust Last Operation
: Displays a pop-up panel to alter properties of the last completed operation. See Adjust Last Operation.

Channels
: Show or hide the Channel Region.

Preview as Backdrop
: Display the current frame in the background.

Refresh All `Ctrl-E`

Reloads external files and refreshes the current frame preview. This is useful when you modified an external file or made a change in a scene that Blender didn't detect.

Frame Selected `NumpadPeriod`
Zooms the display to show only the selected strips.

Frame All `Home`
Zooms the display to show all strips.

Frame Scene/Preview Range
Reset the horizontal view to the current scene frame range, taking the preview range into account if it is active.

Go to Current Frame `Numpad0`
Centers the horizontal timeline on the current frame.

Zoom to Border `Shift-B`
Click and drag to draw a rectangle and zoom to this rectangle.

Limit View to Contents
Prevents you from panning higher than the highest used channel.

Show Markers
Shows the marker region. When disabled, the *Marker* menu is also hidden and marker operators are not available in this editor.

Show Seconds `Ctrl-T`
Shows seconds instead of frames on the time axis.

Sync Visible Range
Synchronizes the horizontal panning and scale of the editor with other time-based editors that also have this option enabled. That way, they always show the same section of time.

Navigation

Play Animation `Spacebar`

Start or stop animation playback. This will start playback in all editors.

Go to Current Frame `Numpad0`

Scrolls the timeline so the current frame is in the center.

Jump to Previous Strip `PageDown`

Moves the playhead to the nearest strip border (start or end) that's before the current frame.

Jump to Next Strip `PageUp`

Moves the playhead to the nearest strip border (start or end) that's after the current frame.

Jump to Previous Strip (Center) `Alt-PageDown`

Moves the playhead to the nearest strip center that's before the current frame.

Jump to Next Strip (Center) `Alt-PageUp`

Moves the playhead to the nearest strip center that's after the current frame.

Range

Set Preview Range `P`

Interactively define the frame range used for preview playback/rendering.

As long as this range is active, playback will be limited to it, letting you repeatedly view a segment of the video without having to manually rewind each time. It also limits the range that gets rendered by *Sequence Render Animation* (see below).

Set Preview Range to Strips

Apply a preview range that encompasses the selected strips.

Clear Preview Range `Alt-P`

Clears the preview range.

Set Start Frame `Ctrl-Home`
Set the Start frame of the scene to the current frame.

Set End Frame `Ctrl-End`
Set the End frame of the scene to the current frame.

Set Frame Range to Strips
Set the Start and End frames of the scene so they encompass the selected strips.

Sequence Render Image
Show the current frame preview as a Render Result where you can save it as an image file.

Sequence Render Animation
Save previews of the frames in the scene range (or the preview range, if active) to a video file or a series of image files. See the Output panel for details.

Note

Sequence Render Image and *Sequence Render Animation* don’t render the final video by default – specifically, they don’t render Scene Strips, instead using the preview’s shading mode (which is initially Solid).

To output a video where the Scene Strips are rendered, use the *Render* menu in the top-bar, or change *Sidebar* ‣ *View* ‣ *Scene Strip Display* ‣ *Shading* to *Rendered*. The latter option is only available if the Video Sequencer is in the *Preview* or *Sequencer & Preview* mode.

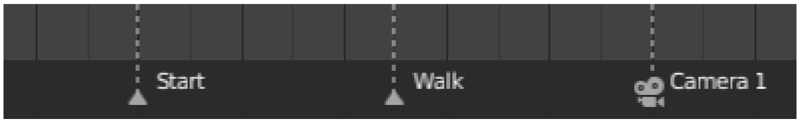
Export Subtitles
Exports Text strips, which can act as subtitles, to a SubRip file (`.srt`). The exported file contains all Text strips in the video sequence.

Toggle Sequencer/Preview `Ctrl-Tab`
Switch the editor mode between *Sequencer* and *Preview*.

Area
Area controls. See the user interface documentation for more information.

Marker Menu

Markers are used to denote frames with key points or significant events within an animation. Like with most animation editors, markers are shown at the bottom of the editor.



Markers in animation editor.

See Editing Markers for details.

Main View

Adjusting the View

Use these shortcuts to adjust the view:

- Pan: `MMB`
- Horizontal scroll: use `Ctrl-Wheel`, or drag the horizontal scrollbar.
- Vertical scroll: use `Shift-Wheel`, or drag the vertical scrollbar.
- Zoom: `Wheel`
- Scale view: `Ctrl-MMB` and drag left/right (horizontal scale) or up/down (vertical scale). Alternatively, you can drag the circles on the scrollbars with `LMB`.

Playhead

The Playhead is the blue vertical line with the current time at the top. It can be moved in the following ways:

- Jump or scrub: click or drag `LMB` in the scrubbing area at the top of the timeline.
- Jump or scrub (alternative): click or drag `Shift-RMB` anywhere in the timeline. If you start dragging on a strip, that strip will be highlighted and displayed *solo* in the preview (all other strips are temporarily muted).
- Move in single-frame increments: `Left`, `Right`, or `Alt-Wheel`.
- Jump to the start or end frame of the scene (or preview range, if active): `Shift-Left` or `Shift-Right`.

While dragging with `LMB` or `Shift-RMB`, you can additionally hold `Ctrl` to snap to the start and end points of strips.

If scrubbing (or regular playback) performs poorly, you can speed it up by creating proxies.

Hint

The current frame is synchronized across all editors, so if you move the Playhead in the Timeline editor for example, it will move in the Video Sequence editor as well (and vice versa).

Toolbar

- Introduction
- Blade

Introduction

Select Box
: Selects or moves from the same tool. Click and drag to create a “box” selection.

Blade
: Create a cut along the strip.

Blade

Reference

Mode::	Sequencer Mode
Tool::	*Toolbar* ‣ *Blade*
Shortcut::	`K`, `Shift-K`

Cuts a strip in two. Specifically, it first shortens the strip so it only shows the content up to the cut point, then adds a second strip that shows the content after the cut point.

Splitting be done in two different ways:

- Select the tool in the Toolbar and click a strip at the time point where you want to split it.
- Alternatively, select one or more strips, place the Playhead at the time point where you want to split them, and press one of the keyboard shortcuts below.

You can choose between the following split types:

Soft `K`

> After splitting, it's still possible to restore the cut content in the new strips by dragging their handles.

Hard `Shift-K`

> After splitting, it's not possible to restore the cut content by dragging handles. However, you can still restore it by changing the Hold Offset in the Sidebar.

Sidebar

- Strip
  - Header
  - Compositing
  - Transform
  - Crop
  - Video
  - Color
  - Sound
  - Time
  - Source
- Modifiers
  - Common Options
  - Types
- Cache
  - Cache Settings
  - Strip Cache
- Proxy
  - Proxy Settings
  - Strip Proxy & Timecode

Strip

Header

Type

Strip type, represented by an icon.

Name

A text field to adjust the name of the strip, which is shown on the strip in the timeline.

Color Tag

Strips are given a Default Color based on their type; using the color tag, you can assign a custom color to help organize your sequence.

Mute

Uncheck to prevent the strip from producing output.

Compositing

Reference

Panel::	*Sidebar ‣ Strip ‣ Compositing*

Blend

The method for blending the current strip with strips in lower channels. See Blend Modes for more information.

Opacity

The opacity (alpha) of the strip.

When this property is animated, the opacity is drawn as an overlay on the strip. The overlay will look like a dark section that follows the animation curve. This can be hidden by disabling the F-Curves.

Transform

Reference

Panel::	*Sidebar* ‣ *Strip* ‣ *Transform*

Filter

The technique used to estimate the values of pixels at non-integer coordinates within the image.

Auto::	Automatically choose filter based on scaling factor. • No scale, no rotation, integer positions: *Nearest* • Scaling up by more than 2x: *Cubic Mitchell* • Scaling down by more than 2x: *Box* • Otherwise: Bilinear
Nearest::	No interpolation; uses nearest neighboring pixel (fastest).
Bilinear::	Interpolate between 2×2 samples.
Cubic Mitchell::	Cubic Mitchell filter on 4×4 samples.
Cubic B-Spline::	Cubic B-Spline filter (blurry but no ringing) on 4×4 samples.
Box::	Averages source image samples that fall under destination pixel.

Position X, Y

Used to move the frames along the X and Y axis.

Scale X, Y

Scale the image on the X and Y axis.

Rotation

Rotates the input two-dimensionally along the Z axis.

Mirror
Mirrors the image along the X axis (left to right) or the Y axis (top to bottom).

Crop

Reference

Panel:: *Sidebar ‣ Strip ‣ Crop*

Used to crop the source image. Use *Top*, *Left*, *Bottom*, and *Right* to control the number of pixels that are cropped.

Video

Reference

Panel:: *Sidebar ‣ Strip ‣ Video*

Strobe
Display every nth frame. For example, if you set this to 10, the strip will only display frames 1, 11, 21, 31, 41… of the source.

It is important to realize that this property is a float value. This allows you to strobe effect synced exactly to a beat.

Reverse Frames
Plays the strip backwards starting from the last frame in the sequence.

Color

Reference

Panel:: *Sidebar ‣ Strip ‣ Color*

Saturation
    Adjusts the vividness of colors in the image.

Multiply
    Multiplies the colors by this value. This will increase the brightness.

Multiply Alpha
    Multiply alpha along with color channels when using the *Multiply* option.

Convert to Float
    Converts input to float data.

Sound

Reference

Panel:: *Sidebar ‣ Strip ‣ Sound*

Working with sound is documented further at Sound Strip.

Volume
    Adjusts the perceived loudness or intensity of the sound.

When this property is animated, the volume is drawn as an overlay on the strip. The overlay will look like a dark section that follows the animation curve. This can be hidden by disabling the F-Curves. The value is also reflected in the waveform.

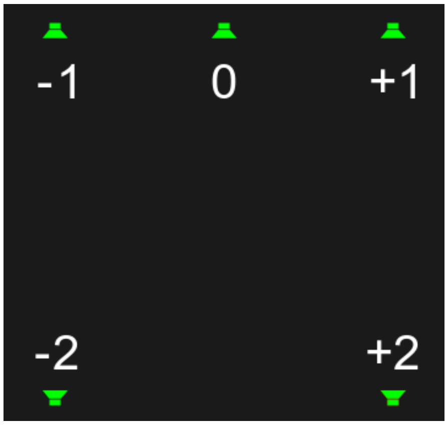
Offset
    Offset of the sound from the beginning of the strip, expressed in seconds.

Mono
    Mixdown all audio channels into a single channel.

Pan

Used to pan the audio between speakers in multichannel audio. Only mono sources can be panned; if the source file is not mono, enable *Mono* to mix the channels together.

This value basically represents the angle at which it's played if you multiply the value by 90 degrees.



For stereo, output panning works from left (-1) to center (0) and finally right (1).

To address rear speakers, you can pan to those with higher values, where -2 is back left and 2 is back right.

Tip

For smooth animation you can assign values outside the soft bounds, since the angle wraps around over multiple rotations.

Note

The number of audio channels can be configured in the Audio Output settings.

Display Waveform

Display an approximate waveform of the sound file inside of the Sound strip. The waveform reflects strip volume and its animation using keyframes.

Clipping audio, i.e. values over 100% amplitude, will be shown in red.

This option is only visible if the Waveforms overlay is set to *Strip*.

Time

Reference

Panel:: *Sidebar ‣ Strip ‣ Time*

The Time panel is used to control source and timeline position of the strip.

Lock (padlock icon in panel header)
Prevents the strip from being moved.

Show Retiming Keys
Toggle visibility and selectability of Retiming keys.

Channel
Changes the channel number, or row, of the strip.

Start
Changes the starting frame of the strip, which is the same as selecting and moving the strip.

Duration
Changes the length (in frames) of the strip. This works by changing the end frame, which is the same as selecting and moving the strip's right handle.

End
Shows the ending time and frame of the strip.

Strip Offset Start/End
Positive values will move the strip's handles inwards, making it start later than the start of the source material and stop before its end. This lets you trim down the source material to the part you need. You can enable the Offsets overlay to see the start and end of the full source file.

Negative values will move the strip's handles outwards, making it start earlier than the start of the source material and stop after its end. This lets you show the first and/or last frame as a frozen image for some time.

Instead of adjusting these offsets in the Sidebar, you can also drag the strip's handles.

Hold Offset Start/End

Used for trimming frames off the start/end of the source material. At first sight, this does the same as the *Strip Offset* properties, but you can in fact combine them to hold (freeze) a frame other than the first or last one. For example, if you set the *Hold Offset Start* to 10 and the *Strip Offset Start* to -20, the video will first show the 11th frame of the source for 21 frames, and then play the remaining frames.

Current Frame

The Playhead's frame number relative to the start of the strip.

Source

Reference

Panel:: *Sidebar ▸ Strip ▸ Source*

The Source panel shows (and lets you change) the file which the strip points to, as well as how this file should be displayed.

File

The full path of the source file.

Color Space

The color space of the source file.

The list of color spaces depends on the active OCIO config. The default supported color spaces are described in detail here: Default OpenColorIO Configuration

Alpha Mode

If the source file has an Alpha (transparency) channel, you can choose between Straight Alpha and Premultiplied Alpha.

Stream Index *Movie Strip*

The video stream to use, in case there are multiple.

Deinterlace

Applies deinterlacing to analog video.

Source Information

Displays information about the strip's media.

Resolution

Resolution of the active strip's image output.

FPS *Movie Strip*

The frame rate encoded into the video file. If this value does not match the scene's Frame Rate, the perceived speed of the media will be wrong unless the speed is changed to account for the difference.

Options for Image Strips

Directory

The directory that contains the source file(s).

Filename

The name of the source file. For image sequences, this will be different for each frame.

Change Data/Files

Opens a File Browser to let you select a new set of images (as an alternative to modifying the above textboxes). Same as *Strip* ‣ *Inputs* ‣ *Change Paths/Files*.

Options for Sound Strips

Sound

Data-block menu to select a sound.

File Path

Path to the file used by the selected sound data-block.

Pack
: Pack the sound into the blend-file.

Caching
: Sound file is decoded and loaded into the RAM.

Source Information
: Displays information about the strip’s media.

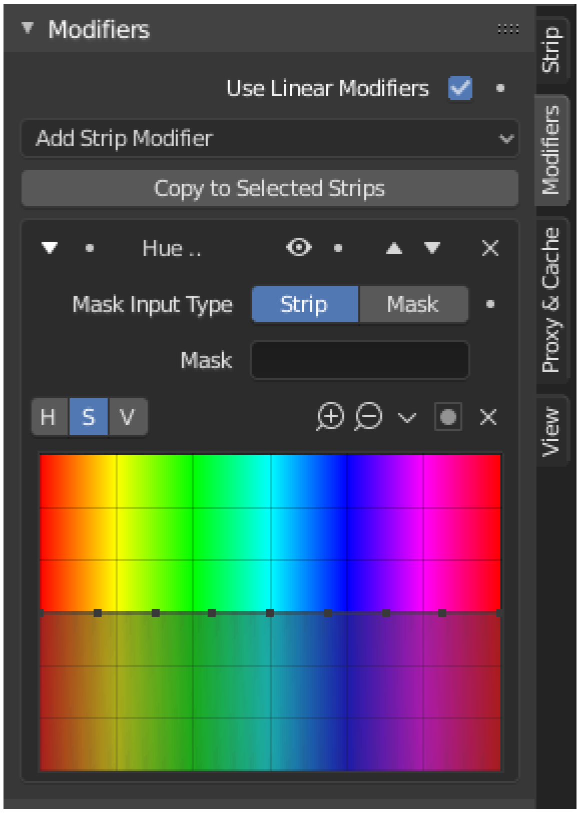
  Samplerate
  : The number of samples per second the audio is encoded at.

  Channels
  : The number of audio channels encoded into the audio stream.

Modifiers

Reference

Panel:: *Sidebar region* ▸ *Modifiers* ▸ *Modifiers*


Modifiers
Use Linear Modifiers ☑
Add Strip Modifier
Copy to Selected Strips
Hue ..
Mask Input Type
Strip
Mask
Mask
H
S
V
Strip
Modifiers
Proxy & Cache
View

Modifiers are used to make adjustments to the image, like contrast, brightness, saturation, color balance and applying masks.

You can add these modifiers directly to a media strip, or you can use them within an [Adjustment Layer]() strip, making them apply to several media strips in one go.

Linear Modifiers

Calculates modifiers in [linear color space]() instead of the [Sequencer color space]().

Calculating modifiers in linear space will match the image processing of the compositor. In most cases, this should be enabled; working in a non-linear workflow could have unpredictable results.

Copy to Selected Strips

Copies the modifiers to the selected strips, either replacing their current modifiers or appending to them.

Common Options

Each modifier has several buttons at its top:

Mute (eye icon)
Disables the modifier. Useful to compare the image with or without modifications.

Move (up/down arrow icon)
These two buttons change the modifier's position in the stack which affects its computation order.

(Remove Strip Modifier)
Deletes the modifier from the stack.

Masking

You can mask each modifier to limit the area of the image it affects. This can be done using either a Mask or another strip.

Mask Input Type
Type of input data used for the mask.

Strip::	Use the grayscale representation of another strip's image.
Mask::	Use a Mask data-block.

Mask
The Strip or Mask data-block to use.

Mask Time *Mask Input Only*
How the start frame of the mask is calculated.

Relative::	Mask animation is offset to the start of the strip.
Absolute::	Mask animation is in sync with the scene frame.

Types

Currently, the following modifiers are supported:

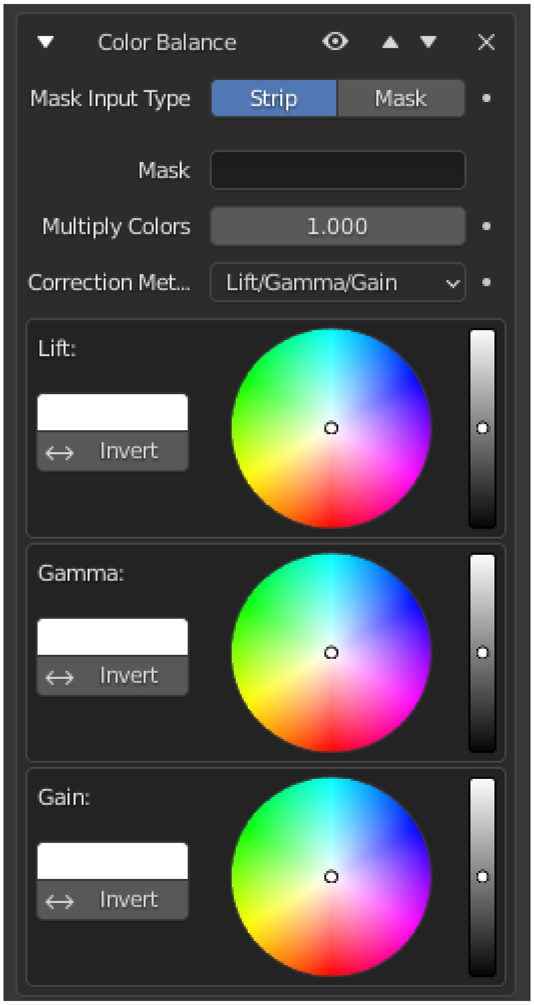
Brightness/Contrast Modifier

Adjusts the brightness and contrast of the image.

Color Balance Modifier

Color balance adjustments, either by the Lift/Gamma/Gain or the Offset/Power/Slope method.

This modifier works similar to the Color Balance Node.



Mask Input Type Strip Mask

Mask

Multiply Colors 1.000

Correction Met... Lift/Gamma/Gain

Depending on the selected method, the following operations can be applied to the color values in the sequencer color space:

Lift/Gamma/Gain

Lift

Increases the value of dark colors.

Gamma

Adjusts midtones.

Gain

Adjusts highlights.

Offset/Power/Slope (ASC-CDL)

The following formula is applied to each RGB color value separately: $c_{out} = (c_{in}×s + o)^p$

Slope

The multiplier s influences all color values except black. Its effect is stronger the brighter the source color is.

Offset

Shifts color values after applying Slope by adding the Offset \(o\) to them. Note that the selected value shown in the UI will be reduced by 1, so the default value of 1 means effectively no offset is applied.

Power

Overall exponent \(p\), which mainly adjusts the midtones.

Curves Modifier

Color and RGB curves.

This modifier works the same as the RGB Curves Node.

Hue Correct Modifier

HSV multi points curves.

This modifier works the same as the Hue Correct Node.

Mask Modifier

The mask modifier is used to affect the Alpha Channel of the current strip.

Mask Input Type

Type of input data used for the mask.

Strip::	Use the grayscale representation of another strip to affect the alpha of the current strip.
Mask::	Use a mask data-block to affect the alpha of the current strip.

Mask

The Strip or Mask data-block to use.

Mask Time *Mask Input Only*

How the start frame of the mask is calculated.

Relative::	Mask animation is offset to the start of the strip.

Absolute::	Mask animation is in sync with the scene frame.

Tone Map Modifier

Used to map one set of colors to another in order to approximate the appearance of high dynamic range images in a medium that has a more limited dynamic range.

This modifier works the same as the Tone Map Node.

White Balance Modifier

Used to adjust the white balance by choosing the color that should be white.

Sound Equalizer Modifier

This modifier can be used to emphasize or suppress sound frequencies. The range is limited to 35Hz - 20kHz and +/-35dB.

Cache

The Cache is used to save preview frames in memory, so they can later be displayed much faster than if they were rendered from scratch. Cache capacity can be set in the System tab of the Preferences.

See also

Which frames are cached can be visualized by enabling Show Cache.

Cache Settings

Reference

Panel:: *Sidebar ‣ Cache ‣ Cache Settings*

In this panel, you can select the preview rendering stages at which strip images should be cached. These settings apply to all strips.

Cache

- Raw
  - Cache raw images right after they're read from the drive, for faster tweaking of strip parameters at the cost of memory usage.
- Pre-processed
  - Cache strip images after applying cropping, scaling, saturation and so on, for faster tweaking of effects at the cost of memory usage.
- Composite
  - Cache strip images after blending with lower channels and applying effects, for faster tweaking of stacked strips at the cost of memory usage.

Final
    Cache the final rendered frame.

Display

Visualize cached images on the timeline.

Cache
    Raw
        Visualize cached raw images on the timeline.

    Pre-processed
        Visualize cached pre-processed images on the timeline.

    Composite
        Visualize cached composite images on the timeline.

    Final
        Visualize cached final images on the timeline.

Strip Cache

Reference

Panel:: *Sidebar ‣ Cache ‣ Cache Settings*

This panel sets the types of images that will be cached for the active strip. When enabled, these properties override the above Cache Settings.

Cache
    Raw
        Cache raw images read from drive, for faster tweaking of strip parameters at the cost of memory usage.

    Preprocessed
        Cache preprocessed images, for faster tweaking of effects at the cost of memory usage.

Composite

Cache intermediate composited images, for faster tweaking of stacked strips at the cost of memory usage.

Proxy

As projects involve increasingly high-resolution footage, the performance of the video preview can decrease drastically. To combat this, Blender can generate proxies – copies of the original footage stored at a lower quality and/or resolution – to maintain a smooth editing experience without compromising visual fidelity in the end result.

The quickest way to set up proxies for videos is to simply select a Proxy Render Size in the *View* tab (visible when the editor is in *Preview* or *Sequencer & Preview* mode). This will automatically enable the selected proxy resolution in all the strips and start generating the downscaled video files.

You can use the *Proxy* tab if you want to configure proxies in more detail (or create proxies for image sequences).

Proxy Settings

Reference	
Panel::	*Sidebar region ‣ Proxy ‣ Proxy Settings*

Contains scene-wide proxy settings.

Storage

How proxies are stored for the project.

Per Strip::	Each strip can specify where to store its proxies (see below).
Project::	All proxies are stored in one directory. Proxy Directory The location to store the proxies for the project.

Set Selected Strip Proxies

Shows a pop-over that lets you choose the resolution(s) to generate and whether to overwrite existing proxy files. Once you confirm with the *Set* button, your choices are applied to the selected strips. You can view and tweak the settings for individual strips in the *Strip Proxy & Timecode* panel (see below).

In the *Preview* mode, where the *Proxy* tab is not available, this is instead done through the menu *View ‣ Proxy ‣ Setup*.

Rebuild Proxy and Timecode Indices

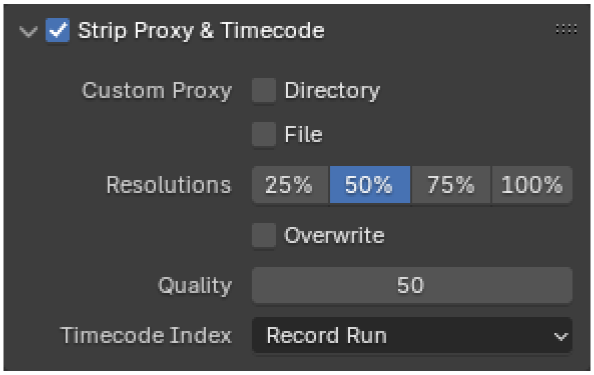
Generates proxies and time indices for the selected strips.

In the *Preview* mode, where the *Proxy* tab is not available, this is instead done through the menu *View ‣ Proxy ‣ Rebuild*.

Strip Proxy & Timecode

Reference

Panel:: *Sidebar region ‣ Proxy & Timecode ‣ Strip Proxy & Timecode*



☑ Strip Proxy & Timecode

Custom Proxy ☐ Directory

☐ File

Resolutions: 25% **50%** 75% 100%

☐ Overwrite

Quality: 50

Timecode Index: Record Run

Contains strip-specific proxy settings. The checkbox in the header can be used to enable/disable proxy generation.

Custom Proxy

Directory

By default, all generated proxy videos are stored to the folder `<path of original footage>/BL_proxy/<clip name>`, but this can be changed to a custom directory using this option.

File

Allows you to use preexisting proxies.

Resolutions

The resolution(s) of the proxy videos to generate; multiple sizes can be selected.

Overwrite

Whether to overwrite existing proxy files or keep them.

Quality

The video/image quality for proxies.

Timecode Index

When you are working with footage directly copied from a camera without preprocessing it, there might be numerous artifacts, mostly due to seeking to a given frame in the sequence. This happens because such footage usually does not have correct frame rate values in the file header. This issue can still arise when the source clip has the same frame rate as the scene settings. In order for Blender to correctly calculate the frames and frame rate there are two possible solutions:

1. Preprocess your video with e.g. MEncoder to repair the file header and insert the correct keyframes.
2. Use the Timecode Index option in Blender.

None::	Ignore generated timecodes, seek in movie stream based on calculated timestamp.
Record Run::	Seek based on timestamps read from movie stream, giving the best match between scene and movie times.
Record Run No Gaps::	Effectively convert movie to an image sequence, ignoring incomplete or dropped frames, and changes in frame rate.

Note

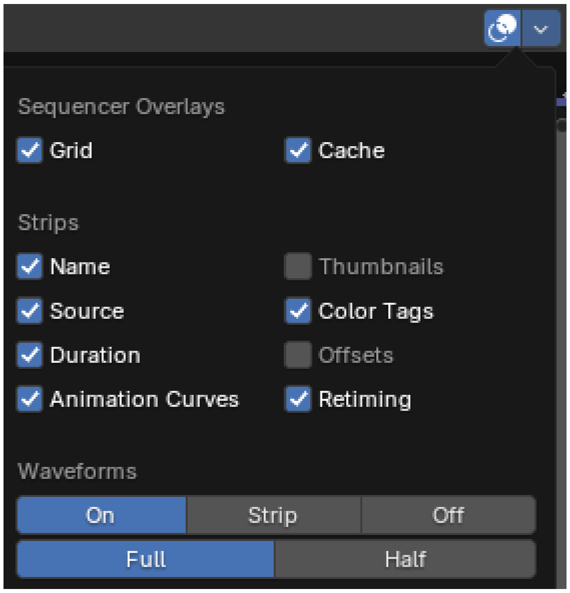
Record Run is the Timecode Index which usually is best to use, but if the source file is totally damaged, *Record Run No Gaps* will be the only chance of getting an acceptable result.

Display

Sequencer Overlays

Reference

Header:: *Overlays*


Sequencer Overlays
☑ Grid ☑ Cache

Strips
☑ Name ☐ Thumbnails
☑ Source ☑ Color Tags
☑ Duration ☐ Offsets
☑ Animation Curves ☑ Retiming

Waveforms
[✓ On] Strip Off
[✓ Full] Half

Overlays are information that is displayed on top of the sequencer region. The icon toggles all overlays in one go, while the drop-down button shows a pop-over where you can toggle individual ones:

Grid
    Shows vertical lines at regular time intervals.

Cache
    Visualize cached images on the timeline.

Strips

Name

Shows the Name of each strip.

Source

Shows the file path of each strip.

Duration

Shows the length of each strip (in frames).

Animation Curves

Shows animation curves for volume (Sound strips) and opacity (other strips).

Thumbnails

Displays thumbnails across the full width of each Movie or Image strip. The thumbnail size depends on the vertical zoom level (which can be adjusted by dragging up and down with `Ctrl-MMB`). Zooming in results in taller strips with bigger, but fewer thumbnails. Zooming out results in narrower strips with smaller, but more thumbnails.

Color Tags

Displays each strip in its designated custom color (if applied) rather than a color representing its type. To set a custom color, either click the *Color Tag* button next to the strip's name in *Sidebar ‣ Strip*, or use *Set Color Tag* in the strip's context menu.

Offsets

Shows overflow bars of content that was trimmed from the strip (by moving the strip's handles). See Strip Offset Start/End.

Waveforms

Type

Global options for waveform display on Sound strips.

On::	Enable waveforms for all strips.
Strip::	Use the Display Waveform option of each individual strip.

Off::	Disable waveforms for all strips.

Style

How Waveforms are displayed.

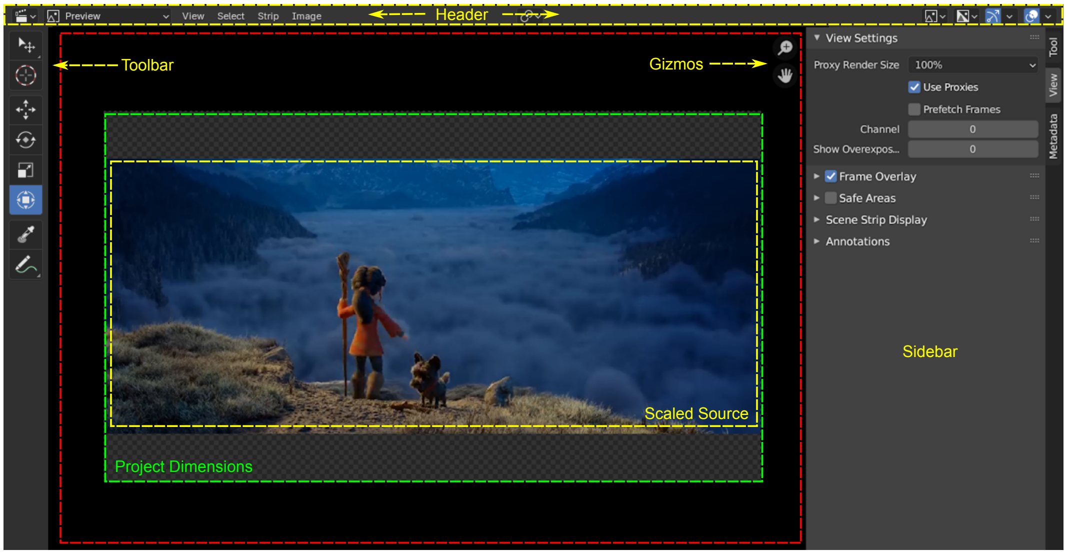
Full::	Displays the audio amplitude.
Half::	Displays the audio level.

Preview

- Introduction
- Header
  - View Menu
  - Select Menu
  - Strip Menu
  - Image Menu
  - Pivot Point
  - Display Mode
  - Display Channels
  - Gizmos
  - Overlays
- Toolbar
- Sidebar
  - Tool
  - View
  - Metadata
- Controls
  - Pivot Point
  - Preview Snapping
- Display
  - Display Mode
  - Gizmos
  - Overlays

Introduction

The Preview mode shows how the final edited video will look like. It also offers tools for moving, rotating, and scaling images, as well as scopes for analyzing color distribution.


Preview
View
Select
Strip
Image
Header
Toolbar
Gizmos
Scaled Source
Project Dimensions
Sidebar
Tool
View
Metadata

▼ View Settings

Proxy Render Size 100%

☑ Use Proxies

☐ Prefetch Frames

Channel 0

Show Overexpos... 0

▸ ☑ Frame Overlay

▸ ☐ Safe Areas

▸ Scene Strip Display

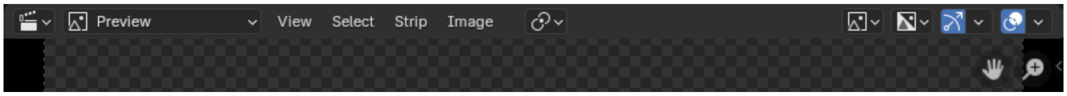
▸ Annotations

Preview mode of the Video Sequencer.

You can pan around the view with `MMB` and zoom with `Wheel` or `NumpadPlus`/ `NumpadMinus`. Alternatively, you can use the gizmos.

Pressing `Home` resets the view, maximizing the size of the preview within the editor’s area.

Header



Header in Preview mode.

View Menu

Toolbar `T`
: Show or hide the Toolbar.

Sidebar `N`
: Show or hide the Sidebar.

Tool Settings
: Show or hide the settings for the currently selected tool.

Preview During Transform
: When enabled, previews the strip's new first/last frame while dragging its left/right handle.

Refresh All
: Reloads external files and refreshes the current frame preview. This is useful when you modified an external file or made a change in a scene that Blender didn't detect.

Frame Selected
: Pan and zoom the view to focus on the selected image.

Fit Preview in Window `Home`

Pan and zoom the view so that the entire video is visible. This enables *Zoom to Fit*.

Zoom

Menu with convenient zoom levels and operations. The zoom levels are calculated based on the images resolution compared to the screen resolution.

- 12.5% (1:8) `Numpad8` zoom out to a factor of 12.5%.
- 25% (1:4) `Numpad4` zoom out to a factor of 25%.
- 50% (1:2) `Numpad2` zoom out to a factor of 50%.
- 100% (1:1) `Numpad1` resets the zoom to 100%.
- 200% (2:1) `Ctrl-Numpad2` zoom in to a factor of 200%.
- 400% (4:1) `Ctrl-Numpad4` zoom in to a factor of 400%.
- 800% (8:1) `Ctrl-Numpad8` zoom in to a factor of 800%.

Zoom In/Out `Wheel`

Zooms the view in or out.

Zoom to Fit `Shift-Home`

Like *Frame All*, but uses as much space in the editor as possible.

Zoom Region `Shift-B`

Zoom in the view to the nearest item contained in the border.

Auto Zoom

As long as this option is enabled, the preview will automatically zoom to keep the video size synchronized with the editor size.

Proxy

See Proxy.

Sequence Render Image

Show the current frame preview as a Render Result where you can save it as an image file.

Sequence Render Animation

Save previews of the frames in the scene range (or the preview range, if active) to a video file or a series of image files. See the Output panel for details.

Note

Sequence Render Image and *Sequence Render Animation* don't render the final video by default – specifically, they don't render Scene Strips, instead using the preview's shading mode (which is initially Solid).

To output a video where the Scene Strips are rendered, use the *Render* menu in the top-bar, or change *Sidebar* ‣ *View* ‣ *Scene Strip Display* ‣ *Shading* to *Rendered*.

Export Subtitles

Exports Text strips, which can act as subtitles, to a SubRip file (`.srt`). The exported file contains all Text strips in the video sequence.

Toggle Sequencer/Preview `Ctrl-Tab`

Switch the editor mode between *Sequencer* and *Preview*.

Area

Area controls. See the user interface documentation for more information.

Select Menu

See Selecting.

Strip Menu

See Editing.

Image Menu

Clear
  Resets the position, rotation, or scale of the selected images.

Apply
  Scale to Fit
    Resizes the selected images so that they're as large as possible while still fitting completely inside the video. They don't get cropped, and their aspect ratio stays the same.

  Scale to Fill
    Resizes the selected images to that they fill the entire video space. They may get cropped, but their aspect ratio stays the same.

  Stretch to Fill
    Resizes the selected images to match the video dimensions. They don't get cropped, but their aspect ratio may change.

Pivot Point

See Pivot Point.

Display Mode

See Display Mode.

Display Channels

Color & Alpha
  Display the preview image with transparency over a checkerboard pattern.

Color
  Ignore the transparency of the preview image (fully transparent areas will be black).

Gizmos

See Gizmos.

Overlays

See Overlays.

Toolbar

Tweak `W`

Lets you select images by clicking, and move them by dragging. Press `W` to cycle between this tool and *Select Box*.

Select Box

Lets you select one image by clicking, or multiple images by dragging a rectangle.

Cursor

Lets you move the 2D Cursor by clicking or dragging with `LMB`.

While dragging, you can press `X` or `Y` to constrain movement to an axis.

If you need extra precision, you can hold `Shift` to move the cursor more slowly than the mouse, or type a number to move it by an exact amount.

The header shows how far the cursor has traveled, including the distance along each axis.

Instead of this tool, you can also drag the mouse while holding `Shift-RMB` (works with all tools) or adjust the 2D Cursor Location in *Sidebar ‣ View*.

Note

By default, the 2D Cursor is only shown while dragging it. To make it permanently visible, enable the *2D Cursor* overlay.

Move `G`

Lets you move the selected images by dragging with `LMB`. Alternatively, you can press `G`, move the mouse, and finally click `LMB` to confirm (or `RMB` to cancel).

If the Active Tools gizmo is enabled, you can drag one of the colored arrows to only move along that one axis. You can also press `X` or `Y` while moving: press once to constrain to the corresponding global axis, a second time to constrain to the local axis, and a third time to remove the constraint again. Yet another way is to hold `MMB` and move the mouse horizontally or vertically.

If you need more precision, you can do one of the following while moving:

- Hold `Shift` to move more slowly.
- Type a number to move by an exact amount.
- Use the arrow keys.

The header shows how far the image has moved, including the offset along each axis.

Instead of using this tool, you can also adjust the Position in the Sidebar’s *Strip* tab (only available in the *Sequencer* and *Sequencer & Preview* modes).

Rotate `R`

Lets you rotate the selected images by holding `LMB` and moving the mouse in a circle. Alternatively, you can press `R`, move the mouse, and finally click `LMB` to confirm (or `RMB` to cancel).

Images are rotated around the Pivot Point, so if it’s off-center, the images will not just rotate but also move around it.

If you need more precision, you can do one of the following while rotating:

- Hold `Shift` to rotate more slowly.
- Hold `Ctrl` to rotate in increments of 5 degrees.
- Type a number to rotate by an exact amount.
- Use the arrow keys.

The header shows how much the image has rotated.

Instead of using this tool, you can also adjust the Rotation in the Sidebar's *Strip* tab (only available in the *Sequencer* and *Sequencer & Preview* modes).

Scale `S`

Lets you resize the selected images by dragging with `LMB`. Alternatively, you can press `S`, move the mouse, and finally click `LMB` to confirm (or `RMB` to cancel).

If the Active Tools gizmo is enabled, you can drag one of the colored lines to only scale along that one axis. You can also press `X` or `Y` while scaling: press once to constrain to the corresponding global axis, a second time to constrain to the local axis, and a third time to remove the constraint again. Yet another way is to hold `MMB` and move the mouse horizontally or vertically.

Images are scaled around the Pivot Point, so if it's off-center and you scale down, the images will not just become smaller but also move towards it.

If you need more precision, you can do one of the following while scaling:

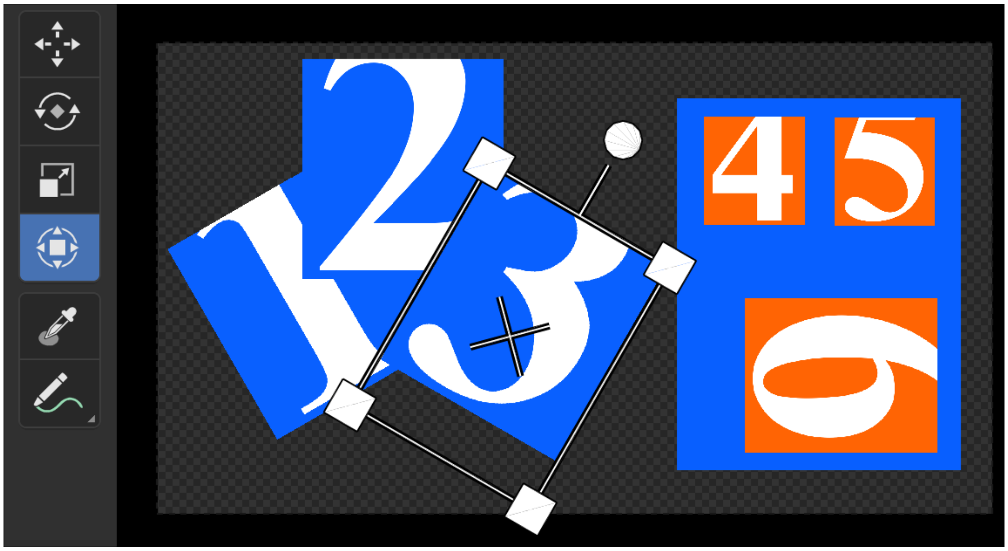
- Hold `Shift` to scale more slowly.
- Hold `Ctrl` to scale in increments of 10%.
- Type a number to scale by an exact factor (e.g. `.5` to make it half the size).
- Use the arrow keys.

The header shows the current scale factor.

Instead of using this tool, you can also adjust the Scale in the Sidebar's *Strip* tab (only available in the *Sequencer* and *Sequencer & Preview* modes).

Transform

Lets you move, rotate, and scale images all using one tool.



The Transform tool

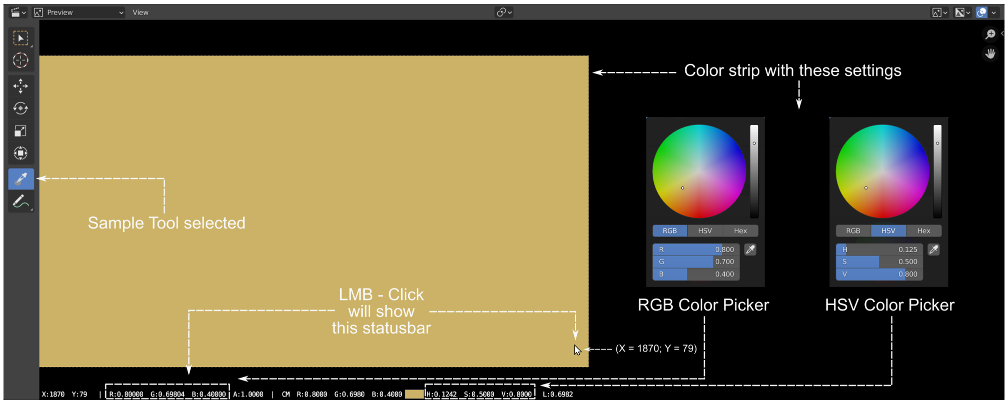
It works as follows:

- Drag the cross in the center to move the image.
- Drag the dot on the protruding line to rotate.
- Drag one of the corners to scale equally along both axes.
- Drag one of the sides to scale along just one axis.

Sample

Lets you sample a pixel's color by holding `LMB`. The editor will show the following information about it on the bottom:

- The X and Y coordinates, in pixels relative to the top left corner.
- The red, green, blue, and alpha components of the pixel, as decimal values between 0 and 1.
- The red, green, and blue components of the pixel with Color Management applied.
- The hue, saturation, value, and luminance components of the pixel with Color Management applied.


Preview
View
Color strip with these settings
Sample Tool selected
LMB - Click
will show
this statusbar
(X = 1870; Y = 79)
RGB
HSV
Hex
R 0.800
G 0.700
B 0.400
H 0.125
S 0.500
V 0.800
RGB Color Picker
HSV Color Picker

```
X:1870  Y:79   | R:0.80000  G:0.69804  B:0.40000 A:1.0000  |  CM  R:0.8000  G:0.6980  B:0.4000  H:0.1242  S:0.5000  V:0.8000  L:0.6982
```

Sample tool example.

Annotate

Draw free-hand annotations.

Annotate Line

Draw a straight line annotation.

Annotate Polygon

Draw a polygon annotation.

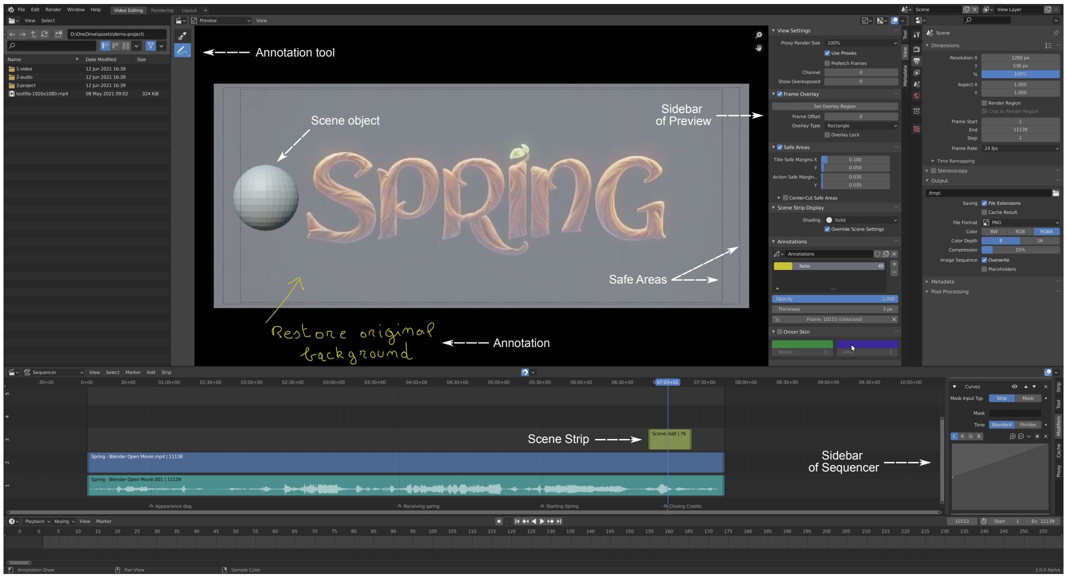
Annotate Eraser

Erase previously drawn annotations.

Sidebar

The Sidebar can be toggled with the menu item *View ‣ Sidebar* or with the shortcut `N`.

The image below shows two Video Sequencers, one in Preview mode and one in Sequencer mode, both with their Sidebar open.


Annotation tool
Scene object
Sidebar of Preview
Safe Areas
Restore original background
Annotation
Scene Strip
Sidebar of Sequencer

Tool

Reference

Editor:: Video Sequencer
View Type:: Preview
Panel:: *Sidebar ‣ Tool tab*

Settings for the active tool.

Drag

What to do when dragging `LMB` on a place other than the tool's gizmo.

Active Tool
: Perform the same action as when dragging the gizmo.

Tweak
: Move the image under the mouse cursor.

Select Box
: Drag a selection rectangle and select all the images that are partially or completely inside it.

View

View Settings

Reference

Editor::	Video Sequencer
View Type::	Preview
Panel::	*Sidebar ▸ View tab ▸ View Settings*

Proxy Render Size
: Controls the preview resolution. Lower values have worse detail but better performance.

No Display::	Disable the preview entirely.
Scene Size::	Preview at the full resolution without using proxies.
25%, 50%, 75%, 100%::	Preview at a downscaled resolution, optionally using proxies (see below). Even selecting 100% can give a performance benefit due to the reduced image quality and corresponding smaller file size.

Use Proxies
: Enable the use of proxies, which are copies of original footage stored at a lower resolution and/or quality for better preview performance.

Proxies can be configured in the *Proxy* tab of the Sidebar, which is however only visible in the *Sequencer* and *Sequencer & Preview* modes.

Prefetch Frames

Automatically fill the cache with frames after the current frame in the background. Use this to achieve a more consistent playback speed. This feature currently doesn't support rendering Scene strips.

Channel

Setting this to 0 shows all channels. Setting it to something higher will only show the channels up to and including that number.

Show Overexposed

Hilight overexposed (bright white) areas using a zebra pattern. The threshold can be adjusted with the slider.

Show Missing Media

Render missing images/movies with a solid magenta color. When disabled, missing content will render fully transparent.

Tip

Strips with missing content will be displayed as red in the timeline.

2D Cursor

Reference

Editor::	Video Sequencer
View Type::	Preview
Panel::	*Sidebar ‣ View tab ‣ 2D Cursor*

The 2D Cursor is the white-red circle with a crosshair that is shown in the preview region (provided that the 2D Cursor overlay is enabled). It can be used as a Pivot Point for rotating and scaling images.

Location X, Y

The location of the 2D Cursor relative to the center of the video. The edges are 0.5 away, so (0.5, 0.5) is the top right corner.

The 2D Cursor's location can also be set with the Cursor tool or by dragging with `Shift-RMB`.

Frame Overlay

Reference

Editor::	Video Sequencer
View Type::	Preview
Panel::	*Sidebar* ▸ *View tab* ▸ *Frame Overlay*

The Frame Overlay lets you display a reference frame for comparing to the current frame.

Set Overlay Region

Lets you drag a rectangle to define the bounds of the overlay. Instead of clicking this button, you can also press `O` while hovering over the preview.

Frame Offset

The time offset between the reference frame and the current frame, in frames.

Overlay Type

How the reference frame should be displayed.

Rectangle::	Display part of the reference frame (defined by the *Overlay Region*) on top of the current frame.
Reference::	Display only the reference frame.
Current::	Display only the current frame.

Tip

Each Video Sequencer editor can have its own *Overlay Type*. This means you can open two of them for showing the current frame and the reference frame next to each other.

Overlay Lock
Keep displaying the same reference frame, even when moving to a different time point. This works by automatically adjusting the *Frame Offset*.

Safe Areas

Reference

Editor::	Video Sequencer
View Type::	Preview
Panel::	*Sidebar ‣ View tab ‣ Safe Areas*

Shows guides indicating the video area where content can be seen across all screens.

See also

Camera Safe Areas.

Scene Strip Display

Reference

Editor::	Video Sequencer
View Type::	Preview
Panel::	*Sidebar ‣ View tab ‣ Scene Strip Display*

Controls how Scene Strips are displayed in the preview.

Shading
The shading mode to use.

Override Scene Settings
Use the Workbench render settings from the current scene rather than the scenes referenced by the strips. Only available for the *Wireframe* and *Solid* shading modes.

Annotations

Reference

Editor::	Video Sequencer
View Type::	Preview
Panel::	*Sidebar ‣ View tab ‣ Annotations*

For managing the Annotations in the Sequencer.

Metadata

Reference

Editor::	Video Sequencer
View Type::	Preview
Panel::	*Sidebar ‣ Metadata tab*

Lists information that has been encoded in the currently visible movie or image file (*not* the file referenced by the selected strip). This can include the filename, the creation date, the camera model etc. This also works for images produced by Blender; see Render Output for the metadata that can be included in this case.

Other graphics programs may also store metadata, but only the text in the header field “Comments” can be read.

Some of this metadata can also be made visible in the preview with the Metadata overlay.

Tip

The metadata can't be edited from Blender. Instead, you can use an external program such as exiftool. For example, the command to change the "Comments" field is:

```
exiftool --comments="My new comment" name-of-file.png
```

Note

Metadata is only displayed for images/movies that don't have an effect applied.

Controls

- Pivot Point
- Preview Snapping

Pivot Point

Reference

Header:: *Pivot Point*
Shortcut:: `Period`

The Pivot Point is the point around which images are rotated and scaled. It's indicated by the position of the selected tool's gizmo.

See also

The Pivot Point of the 3D Viewport

Bounding Box Center

Use the center of the rectangle that's wrapped as tightly as possible around the selected images' origin points.

Median Point

Use the averaged-out position of the selected images' origin points.

2D Cursor

Use the location of the 2D Cursor, for when you want to specify the pivot point by hand.

Individual Origins

Rotate/scale each image around its own origin, rather than rotating/scaling all of them around the same single point like the other options do.

Preview Snapping

The icon toggles snapping; you can also do this temporarily by holding `Ctrl` after starting to transform an image.

Images have multiple snap points; they can snap along their edges, corners, or center.

The drop-down arrow offers the following options:

Snap to

- Borders
  - Snap images to the edges of the render region.
- Center
  - Snap images to the horizontal and vertical center lines of the render region.
- Other Strips
  - Snap images to the snap points of other images.

Display

- Display Mode
  - Image Preview
  - Luma Waveform
  - RGB Parade
  - Chroma Vectorscope
  - Histogram
- Gizmos
- Overlays

Display Mode

Using this pop-up, you can choose between displaying the preview image or a scope that visualizes its color distribution.

Image Preview

Previews what the final video will look like, and lets you change the image layout using various tools.

Luma Waveform

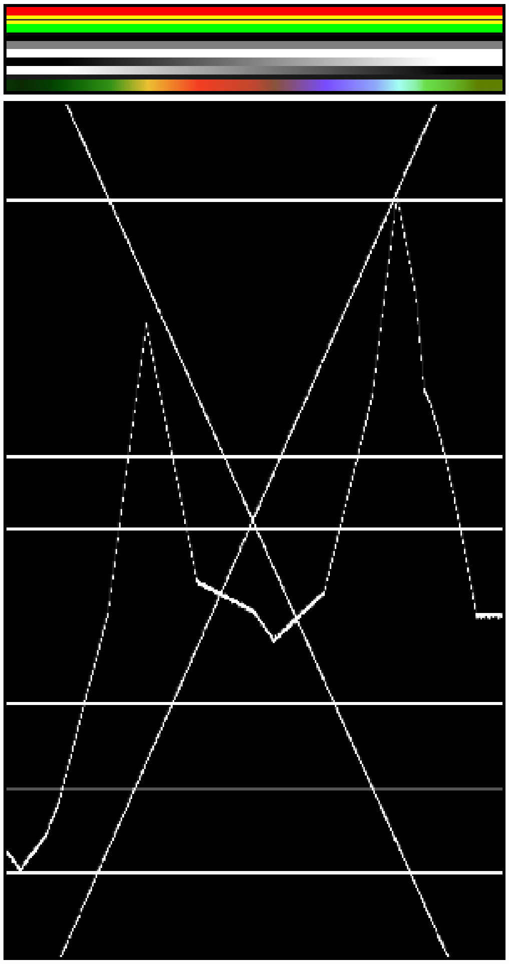
This scope visualizes the luminosity (brightness) distribution of the image, letting you see at a glance if there’s enough contrast and if any areas are under- or overexposed.

The scope works by plotting a curve for each scanline in the current video frame. Another way of saying this is that each pixel column in the luma waveform is a brightness histogram of the corresponding pixel column in the frame. Specifically:

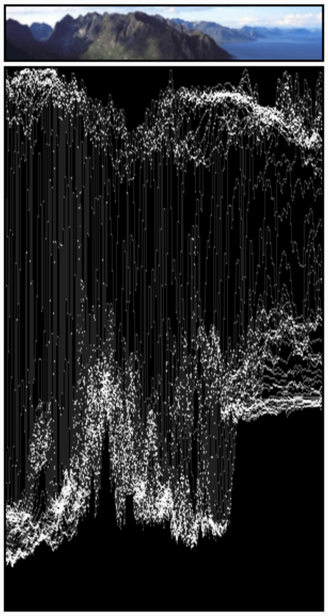
- The horizontal position of a pixel in the waveform refers to a pixel column in the frame.
- The vertical position of a pixel in the waveform refers to a brightness value, going from 0 at the bottom to 1 at the top.
- The brightness of a pixel in the waveform indicates how many pixels in the above frame column have the above brightness. If no pixels in the frame column have this brightness, the waveform pixel is black. If at least three pixels in the frame column have this brightness, the waveform pixel is white.

When this scope is selected, you have the following option in *Sidebar ▸ View ▸ View Settings*:

The examples below show two images and their corresponding luma waveforms.



The various horizontal lines in the luma waveform match the uniform-colored lines of the picture. Note that the ‘gray 20%’ one-pixel width line (inside the yellow strip) is represented in the Luma waveform by a gray line. The two lines drawing an “X” are from the two monochrome gradients. Finally, the broken



The curves are quite visible. We found a luma of 80-100% for the sky, a luma around 40% for the sea, and a luma of 10-20% for the mountains, growing around 40% for the sunny part.

line matches the colored gradient at the bottom.

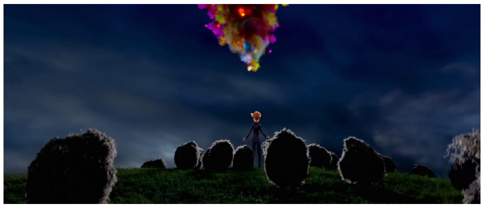
RGB Parade

Shows three waveforms – for the red, green, and blue color channels – instead of just one for the overall image brightness.

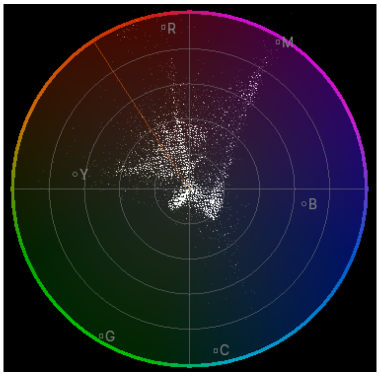
Chroma Vectorscope

This scope visualizes the color distribution of the image. Each point has:

- An angle indicating its hue.
- A distance-from-center indicating its saturation.
- A brightness indicating how many pixels in the video frame have the above hue and saturation.



Example image.



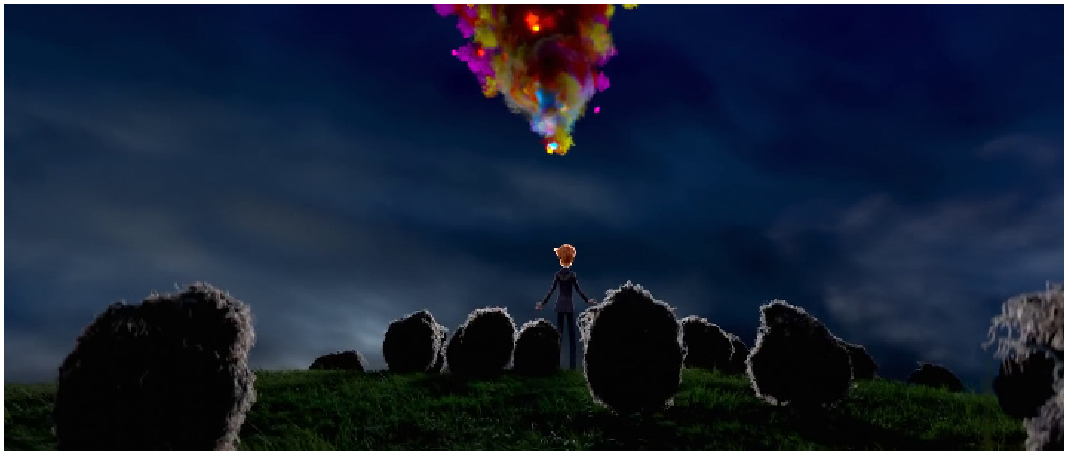
Corresponding Chroma Vectorscope.

Histogram

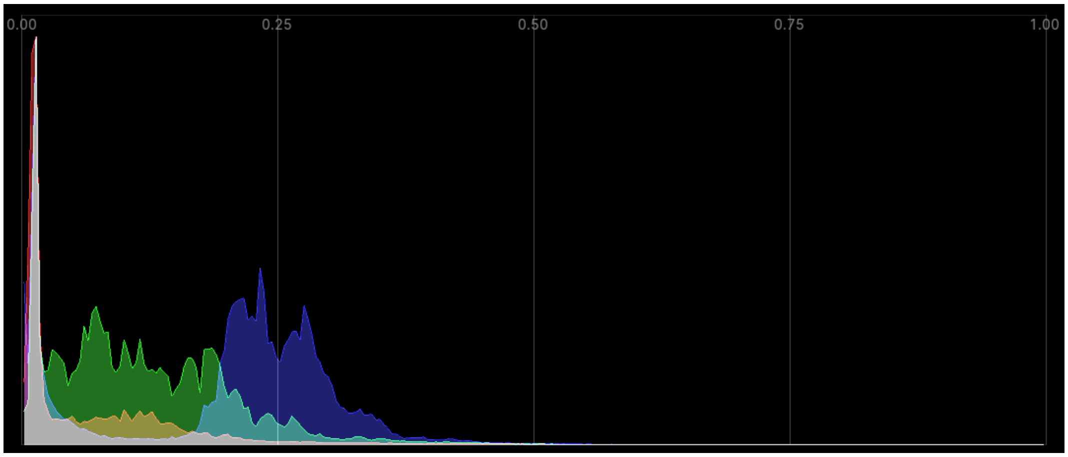
Shows three overlapping graphs, one for each color channel. Within each graph:

- The X axis corresponds to color intensity, going from 0 on the left (black) to 1 on the right (fully red/green/blue).
- The Y axis corresponds to number of pixels.

Use this mode to balance out the tonal range in an image. A well-balanced image should have nice and smooth distribution of color values.



Example image.



Corresponding Histogram.

Gizmos

Reference

Header:: *Gizmos*

Clicking the icon toggles all gizmos in the Video Sequencer. The drop-down button displays a popover with more detailed settings, which are described below.

Navigate
Enable/disable the navigation gizmo.

Active Tools
Enable/disable the gizmo of the active tool.

Overlays

Reference

Header:: *Overlays*

Clicking the icon toggles all overlays in the Video Sequencer. The drop-down button displays a popover with more detailed settings, which are described below.

Image Outline

Shows an outline around the selected images.

2D Cursor

Shows the 2D Cursor.

Frame Overlay

Shows the Frame Overlay for comparing the current frame to a reference frame.

Safe Areas

Shows guides indicating the video area where content can be seen across all screens.

See also

Camera Safe Areas.

Metadata

Shows file metadata.

Annotations

Shows Annotations.

Sequencer & Preview

This view type shows both the preview and the sequencer inside one editor.

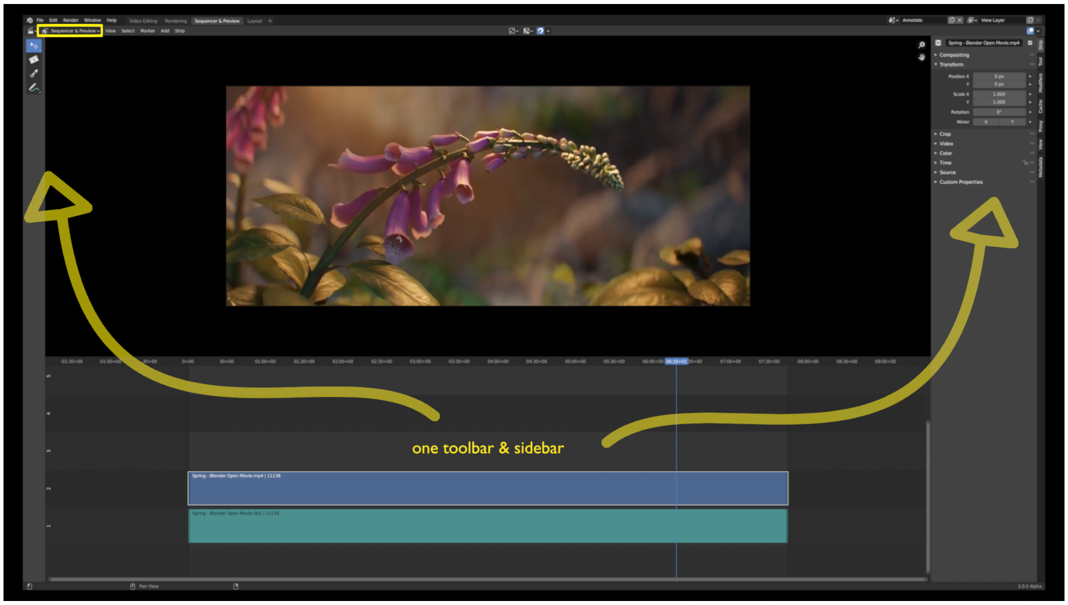


Figure 1: Combined Sequencer & Preview

In general, it's better to avoid this view type and instead have two editors, one serving as the *Preview* and the other as the *Sequencer*. Reasons for this include:

- Most of the *Preview* tools, such as Move and Rotate, are not available in *Sequencer & Preview*.
- You can't add a small editor (such as a File Browser) on the side that only takes up the height of the preview.
- You can't maximize the preview on another screen.

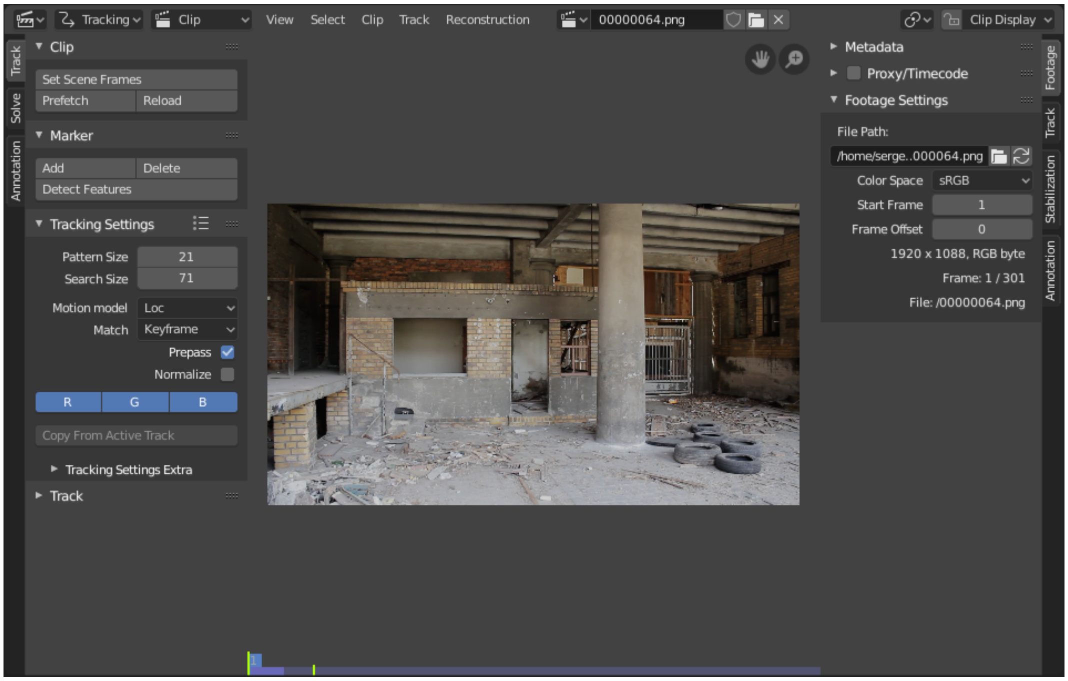
One way of getting two separate editors is to simply open the default *Video Editing* workspace. (You may need to click the "+" icon to the right of the tabs to find it.)

Movie Clip Editor

- Introduction
    - Header
- Display
    - Viewport Gizmos
    - Mask Display
    - Clip Display
- Sidebar Region
    - Footage
    - Track
    - Stabilization
    - View

Introduction

The Movie Clip Editor is used for tracking and masking movies.



Pattern Size 21
Search Size 71
Motion model Loc
Match Keyframe
Prepass ☑
Normalize ☐
File Path: /home/serge..000064.png
Color Space sRGB
Start Frame 1
Frame Offset 0
1920 x 1088, RGB byte
Frame: 1 / 301
File: /00000064.png

Tracking
Clip
View
Select
Clip
Track
Reconstruction
00000064.png
Clip Display
Track
Solve
Annotation
Clip
Set Scene Frames
Prefetch
Reload
Marker
Add
Delete
Detect Features
Tracking Settings
R
G
B
Copy From Active Track
Tracking Settings Extra
Track
Metadata
Proxy/Timecode
Footage Settings
Footage
Track
Stabilization
Annotation

Movie Clip Editor interface.

Header

Mode

Tracking
: For placing markers in a video and tracking their movement.

Mask
: For creating and animating masks.

View Type

Clip
: The default view, for placing and tracking markers.

Graph
: Plots the movement speed of the markers on a graph.

Dope Sheet
: Shows an overview of marker keyframes on a timeline.

View Menu

Toolbar `T`
: Show or hide the tab panel on the left for creating and manipulating markers and masks.

Sidebar `N`
: Show or hide the Sidebar.

Adjust Last Operation
: Display a pop-up panel to alter the properties of the last completed operation.

Frame Selected `NumpadPeriod`
: Zooms and pans the view to focus on the selected items.

Frame All `Home`
: Zooms and pans the view so that the whole video is visible.

Center View to Cursor *Mask Mode*
: Pans the view so that the 2D Cursor is in the center.

Zoom
: Menu with convenient zoom levels and operations. The zoom levels are calculated based on the images resolution compared to the screen resolution.

    - 12.5% (1:8) `Numpad8` zoom out to a factor of 12.5%.

- 25% (1:4) `Numpad4` zoom out to a factor of 25%.
- 50% (1:2) `Numpad2` zoom out to a factor of 50%.
- 100% (1:1) `Numpad1` resets the zoom to 100%.
- 200% (2:1) `Ctrl-Numpad2` zoom in to a factor of 200%.
- 400% (4:1) `Ctrl-Numpad4` zoom in to a factor of 400%.
- 800% (8:1) `Ctrl-Numpad8` zoom in to a factor of 800%.

Zoom In/Out `Wheel`

Zooms the view in or out.

Zoom to Fit `F`

Like *Frame All*, but uses as much space in the editor as possible.

Show Metadata

Displays metadata encoded in the video, if available.

Area

Area controls. See the user interface documentation for more information.

Select Menu

Menu for selecting markers and masks.

Clip Menu

Menu for loading movie clips and creating proxies.

Track Menu

Menu for performing tracking operations.

Reconstruction Menu

Menu for setting up the reconstruction of 3D information from the tracked points in the 2D video.

Add Menu

Circle
: Adds a circle-shaped mask.

Square
: Adds a square-shaped mask.

Mask Menu

Menu for editing masks.

Other

Clip
: A data-block menu used for loading and selecting movies. Both video files and image sequences can be used. When a movie clip is loaded into the Clip editor, extra panels are displayed in the interface.

Pivot Point
: See Pivot Points.

Proportional Editing *Mask Mode*
: See Proportional Editing.

Mask *Mask Mode*
: A data-block menu for creating and selecting masks.

Mask Display *Mask Mode*
: See Mask Display.

Toggle Lock Selection `L`
: Automatically pans the view to follow the selected markers, so that they remain in the same location on screen during tracking and playback.

This option "locks the view onto the selection" and is not to be confused with the Lock option in the Sidebar, which instead prevents you from changing the active marker.

Clip Display

See Clip Display.

Gizmos

See Viewport Gizmos.

Display

- Viewport Gizmos
    - Viewport Gizmos
- Mask Display
- Clip Display
    - Marker Display

Viewport Gizmos

Reference

Mode:: All Modes
Header:: *Gizmos*

Clicking the icon toggles all the gizmos in the Movie Clip Editor. The drop-down button displays a popover with more detailed settings, which are described below.

Viewport Gizmos

Navigate
: Toggle the visibility of the zooming and panning gizmos in the upper right corner.

Mask Display

This popover controls how masks are displayed in Mask mode.

Spline
: Toggles the display of the mask splines. Note that if they're hidden, you won't be able to edit them.

    Edge Display Type
    : Line style of the splines.

Overlay
: Visualizes masks by shading the whole clip.

    Overlay Mode

Alpha Channel::	Displays just the masks as a grayscale image. Excluded areas are black, while included areas are white.
Combined::	Displays the clip with excluded areas darkened.

Blending Factor
: How much excluded areas are darkened when using the "Combined" *Overlay Mode*.

Clip Display

This pop-over contains various display settings for both Tracking mode and Mask mode.

R, G, B

Controls the color channels used for the frame preview. The tracking algorithm works with grayscale images, and with these options, you can check which combination of enabled and disabled channels will yield the best contrast and the least noise.

Note that this only affects the preview. To select which channels to use for the actual tracking, use the Track tab in the Toolbar to set a default for newly created markers, or the Track tab in the Sidebar to configure existing markers.

Grayscale Preview (B/W)

Shows the whole frame as a grayscale image.

Mute (eye icon) `M`

Hides the movie clip and displays a black image instead. This helps to find markers that are tracked inaccurately or not at all.

Render Undistorted

Applies the Lens settings to the video preview to undo lens distortion. Does not change the footage itself.

Show Stable

Applies the 2D stabilization settings to the video preview. Does not change the footage itself.

Grid

Displays a grid which is originally orthographic, but is distorted by the Lens settings. This can be used for manual calibration: the distorted grid lines should match lines in the footage that are meant to be straight.

Calibration
    Applies the Lens settings to annotation strokes. Like the Grid, this option also helps to perform manual calibration.

Display Aspect Ratio
    Changes the aspect ratio for displaying only. It does not affect the tracking or solving process.

Marker Display

Determines how markers are displayed in the editor.

Pattern
    Whether to show the pattern areas of tracks. Can be used to reduce clutter and check how good tracking is.

Search `Alt-S`
    Whether to show the search areas of *selected* tracks. Can be used to reduce clutter and check how good tracking is.

Path
    Shows past (red) and future (blue) positions of tracks relative to the current frame, visualizing how they move. This makes it easier to spot irregularities.

Length
    Length (in frames) of the *Path*.

Show Disabled `Alt-D`
    When unchecked, hides the tracks that are disabled on the current frame (except for the active track, i.e. the one that was selected last). This helps to make the view more clear and see if the tracking is accurate enough.

Info
    Displays the name and status of each selected track. The status can be “keyframed,” “tracked,” “disabled” and so on.

3D Markers

Shows the result of solving the markers' 3D locations based on their 2D movement. Each 3D location is projected back to the movie clip and displayed as a small point, which is colored green if it's close to the original 2D marker (meaning a good solve) or red if it's far away (meaning it needs to be tweaked).

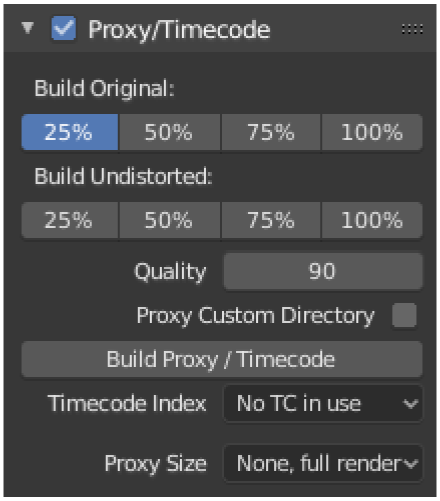
Display Thin

By default, marker areas are displayed as bright boxes with a black outline. This option displays them using thin dashed lines instead.

Sidebar Region

Footage

Proxy/Timecode


☑ Proxy/Timecode
Build Original:
25%
50%
75%
100%
Build Undistorted:
25%
50%
75%
100%
Proxy Custom Directory ☐
Build Proxy / Timecode

Quality: 90

Timecode Index: No TC in use

Proxy Size: None, full render

High-resolution video files can impact Blender's performance, slowing down scrubbing and other operations. To counter this, you can generate one or more proxies, which are copies of the original footage stored at a lower resolution and/or quality. These proxies can then be used as a less resource-heavy standin while working on the scene.

Build Original
: The proxy resolution(s) to generate based on the original, distorted footage.

Build Undistorted
: The proxy resolution(s) to generate based on the undistorted footage (that is, with the Lens settings applied to undo the distortion in the recording).

Quality
: The image quality for the proxies.

Proxy Custom Directory
: By default, proxies are stored to a `BL_proxy` subfolder next to the original file. Use this option to specify a different location.

Build Proxy/Timecode
: Generates proxies based on the settings above, as well as timecode files. Instead of using this button, you can also click *Clip* ▸ *Proxy* ▸ *Rebuild*

Proxy and Timecode Indices.

Timecode Index

When you are working with footage directly copied from a camera without preprocessing it, there might be numerous artifacts, mostly due to seeking to a given frame in the sequence. This happens because such footage usually does not have correct frame rate values in the file header. This issue can still arise when the source clip has the same frame rate as the scene settings. In order for Blender to correctly calculate the frames and frame rate there are two possible solutions:

1. Preprocess your video with e.g. MEncoder to repair the file header and insert the correct keyframes.
2. Use the Timecode Index option in Blender.

None::	Ignore generated timecodes, seek in movie stream based on calculated timestamp.
Record Run::	Seek based on timestamps read from movie stream, giving the best match between scene and movie times.
Record Run No Gaps::	Effectively convert movie to an image sequence, ignoring incomplete or dropped frames, and changes in frame rate.

Note

Record Run is the Timecode Index which usually is best to use, but if the source file is totally damaged, *Record Run No Gaps* will be the only chance of getting an acceptable result.

Proxy Render Size

Which proxy size to use for display. Depending on the Render Undistorted setting, Blender will use either the Original proxy or the Undistorted proxy.

Footage Settings

See Image Settings.

Track

See Track.

Stabilization

See 2D Stabilization.

View

2D Cursor

The 2D Cursor is the dashed crosshair in the main region. It can be used as a transformation pivot point by selecting the corresponding option in the editor's header.

Note that the 2D Cursor is only available in Mask mode, not in Tracking mode.

Location X, Y

> The relative location of the 2D Cursor, going from (0, 0) for the bottom left corner to (1, 1) for the top right corner.
>
> You can also position the 2D Cursor by clicking `Shift-RMB` in (or around) the video.

Annotations

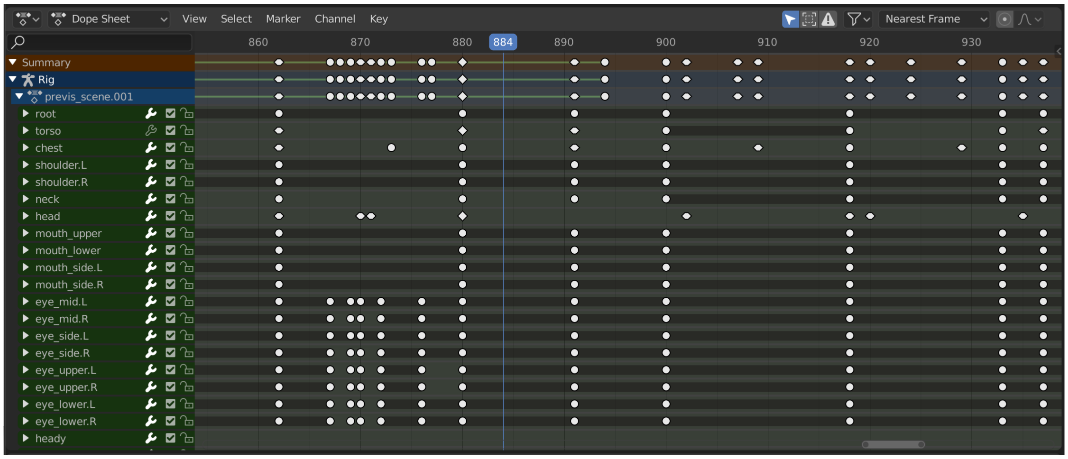
See Annotations.

Dope Sheet

- Introduction
    - Dope Sheet Modes
    - Main Region
- Navigating
    - View Menu
    - Filters
- Editing
    - Select Menu
    - Marker Menu
    - Channel Menu
    - Key Menu
    - Snap
    - Proportional Editing
- Modes
    - Action Editor
    - Shape Key Editor
    - Grease Pencil
    - Mask
- Sidebar
    - Action Panel
    - Custom Properties

Introduction

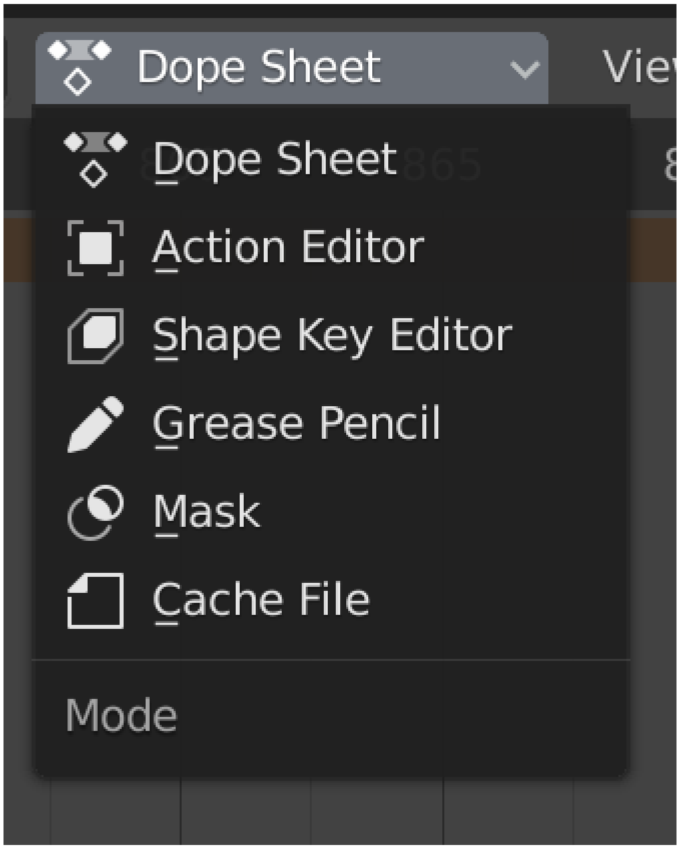
The Dope Sheet offers a bird’s-eye view of the keyframes inside the scene. It’s inspired by classical hand-drawn animation, where animators make use of a chart showing exactly when each drawing, sound, and camera move will occur, and for how long.


Dope Sheet
View
Select
Marker
Channel
Key
Nearest Frame
860
870
880
884
890
900
910
920
930
Summary
Rig
previs_scene.001
root
torso
chest
shoulder.L
shoulder.R
neck
head
mouth_upper
mouth_lower
mouth_side.L
mouth_side.R
eye_mid.L
eye_mid.R
eye_side.L
eye_side.R
eye_upper.L
eye_upper.R
eye_lower.L
eye_lower.R
heady

The Dope Sheet.

Dope Sheet Modes

The editor has several different modes that can be selected from a dropdown in the header. The default *Dope Sheet* mode gives an overview of most types of animatable data. For others, such as masks, you need to switch to a more specific mode.


Dope Sheet
View
Dope Sheet
Action Editor
Shape Key Editor
Grease Pencil
Mask
Cache File
Mode

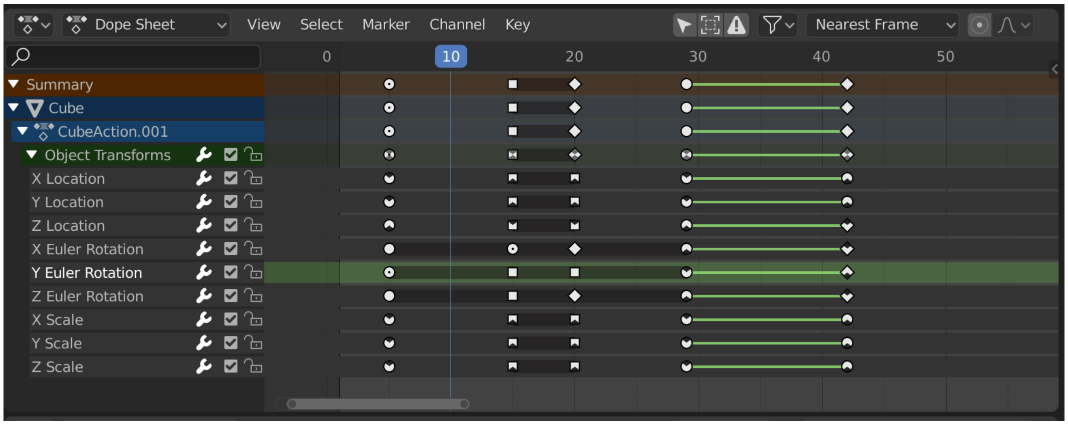
Dope Sheet modes.

The modes are as follows:

- Dope Sheet
- Action Editor
- Shape Key Editor
- Grease Pencil
- Mask
- Cache File: originally meant to show the baked animation data in Alembic files, but never implemented.

Main Region

The Dope Sheet Editor shows a stack of channels (animatable properties), and for each channel, a series of keyframes laid out along the time axis.


Dope Sheet
View
Select
Marker
Channel
Key
Nearest Frame
0
10
20
30
40
50
Summary
Cube
CubeAction.001
Object Transforms
X Location
Y Location
Z Location
X Euler Rotation
Y Euler Rotation
Z Euler Rotation
X Scale
Y Scale
Z Scale

The Dope Sheet Editor with object channels.

Keyframes can take on various colors and shapes:

Gray	Unselected
Yellow	Selected
Other colors	Custom keyframe tag set by the user (*Key* ‣ *Keyframe Type*)
Diamond	Free Keyframe Handle (*Key* ‣ *Handle Type*)
Round	Auto-Clamped Keyframe Handle
Circle	Automatic Keyframe Handle
Square	Vector Keyframe Handle
Rhombus	Aligned Keyframe Handle

Gray bar between keys	Held key (the two keyframes are identical)
Green line between keys	The curve segment uses custom interpolation (*Key* ▸ *Interpolation Mode*)
Upwards arrow	Local maximum in curve (visible if *View* ▸ *Show Curve Extremes* is enabled)
Downwards arrow	Local minimum in curve

Keyframes can be selected by clicking and moved by dragging. See the Select and Key menus for more options.

Navigating

As with most editors, you can:

- Pan the view vertically (channels) and horizontally (time) by dragging `MMB`.
- Zoom in and out by rolling `Wheel` or dragging `Ctrl-MMB`.

You can also use the scrollbars for this.

View Menu

Sidebar `N`

Shows or hides the Sidebar Region.

Adjust Last Operation

Displays a pop-up panel to alter the properties of the last completed operation. See Adjust Last Operation.

Channels

Shows or hides the Channels region (the list of animated property names on the left).

Frame Selected `NumpadPeriod`

Pans and zooms the view to focus on the selected keyframes.

Frame All `Home`

Pans and zooms the view to show all keyframes.

Frame Scene/Preview Range

Reset the horizontal view to the current scene frame range, taking the preview range into account if it is active.

Go to Current Frame `Numpad0`

Pans the view so the Playhead is in the center.

Multi-Word Match Search

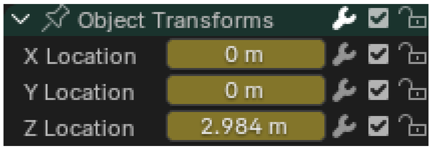
Lets you filter by multiple search terms instead of just one (in the search textbox above the channel list and in the Filters popover). The terms are space-separated, so you can for example type “loc rot” to find all channels that have “loc” or “rot” in their name. If this option were disabled, the list would only show channels containing the text “loc rot”, of which there are likely none.

Realtime Updates

Whether to update other views (such as the 3D Viewport) while you’re moving keyframes around. If disabled, the other views only get updated once you finish the move.

Show Sliders

Shows a value slider next to each channel. Adjusting such a slider automatically creates a keyframe.



Object Transforms

X Location 0 m

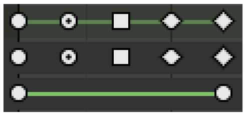
Y Location 0 m

Z Location 2.984 m

Sliders.

Show Handles and Interpolation

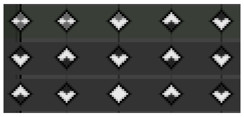
Displays keyframes using shapes that represent their Bézier handle type. In addition, if a keyframe uses a non-default interpolation type for the curve segment that comes after it, this is indicated by a green line.



Handle types.

See Handles & Interpolation Display.

Show Curve Extremes



Detects keys where the curve changes direction, and marks them by displaying an arrow inside their shape. Local maxima (hills) are shown as up arrows, while local minima (valleys) are shown as down arrows.

Extreme markers.

A keyframe may show both arrows, namely when it's part of a summary row containing a channel with a maximum and one with a minimum.

Auto-Merge Keyframes

Automatically merge keyframes that end up on the same frame after transformation.

Show Markers

Shows the marker region (provided any markers have been defined). When disabled, the Marker menu is also hidden and marker operators are not available in this editor.

Show Seconds `Ctrl-T`

Shows timing in seconds instead of frames.

Sync Visible Range

Synchronizes the horizontal panning and scale of the editor with other time-based editors that also have this option enabled. That way, they always show the same section of time.

Set Preview Range `P`

Lets you drag a box to define a time range for previewing. As long as this range is active, playback will be limited to it, letting you repeatedly view a segment of the animation without having to manually rewind each time.

You can change the start or end frame using the corresponding button in the Timeline editor's Playback popover. Alternatively, you can simply run *Set Preview Range* again.

Clear Preview Range `Alt-P`

Clears the preview range.

Set Preview Range to Selected `Ctrl-Alt-P`

Applies a preview range that encompasses the selected keyframes.

Toggle Graph Editor `Ctrl-Tab`

Changes the area’s editor to the Graph Editor.

Area

Area controls. See the user interface documentation for more information.

Filters

These filters are available in the funnel dropdown button in the header.

Summary

Toggles the “Summary” row at the top of the Channels region. This row shows the union of all keyframes across all channels.

Only Show Selected

Only show keyframes belonging to objects/bones/… that are selected.

Note

If this option is enabled, the Dope Sheet may not show all material keyframes of the selected objects. Instead, it only shows the keyframes belonging to the selected nodes in the Shader Editor.

Show Hidden

Show keyframes from objects/bones/… that are hidden.

Only Show Errors

Only show channels that have errors (for example, because they try to animate a property that doesn’t exist on the object).

Search

Filters the channel list by a search term (or multiple search terms if *Multi-Word Match Search* is enabled).

Filtering Collection

Select a collection to only show keyframes from objects in that collection.

Filter by Type

Filter curves by property type.

Sort Data-Blocks

Sorts data-blocks alphabetically to make them easier to find.

If your playback speed suffers because of this (should only really be an issue when working with lots of objects), you can turn it off.

Editing

Select Menu

See also

Selecting.

All `A`
    Selects all keyframes.

None `Alt-A`
    Deselects all keyframes.

Invert `Ctrl-I`
    Inverts the selection.

Box Select `B`
    Lets you drag a box and selects the keyframes inside it.

Box Select (Axis Range) `Alt-B`
    Lets you drag a box and selects the keyframes inside the corresponding time range, even if they're above or below the box.

Circle Select `C`
    Displays a circle around the cursor, which you can drag over keyframes to select them.

Lasso Select `Ctrl-RMB`
    Lets you draw a freehand shape and selects the keyframes inside it.

More `Ctrl-NumpadPlus`

Expand the selection to include the neighbors (in time) of the currently selected keys.

Less `Ctrl-NumpadMinus`
Deselect keyframes with fewer than two selected neighbors.

Select Linked `L`
Select keys that are on the same channel as a key that's already selected.

Columns on Selected Keys `K`
Selects keys that are on the same frame as a key that's already selected.

Column on Current Frame `Ctrl-K`
Selects all the keys that are on the current frame.

Columns on Selected Markers `Shift-K`
Selects keys that are on the same frame as a selected marker.

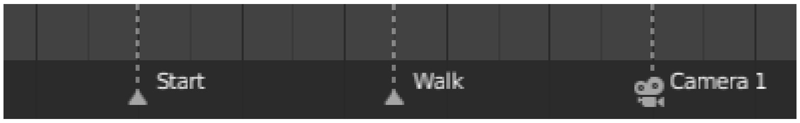
Between Selected Markers `Alt-K`
Selects keys that lie between the leftmost and rightmost selected markers.

Before Current Frame `[`
Select the keys that lie before (or on) the current frame. You can also click `Shift-Ctrl-LMB` anywhere to the left of the Playhead.

After Current Frame `]`
Select the keys that lie after (or on) the current frame. You can also click `Shift-Ctrl-LMB` anywhere to the right of the Playhead.

Marker Menu

Markers are used to denote frames with key points or significant events within an animation. Like with most animation editors, they're shown at the bottom.



Markers in animation editor.

There are some options that are exclusive to the Dope Sheet editor:

Sync Markers
: Whether to also move the selected markers when moving the selected keyframes.

Show Pose Markers *Action Editor*
: Instead of showing the global scene markers, show the local pose markers (which only exist inside the action). While this option is active, the *Add Marker* menu item will also create pose markers instead of scene markers.

Make Markers Local *Action Editor*
: Converts the selected scene markers into pose markers, making them only visible inside the currently selected action.

For information about the other marker tools, see Editing Markers.

Channel Menu

See Graph Editor Channels.

Key Menu

Most items in this menu are documented on the Graph Editor’s Editing page. One important difference is that scaling keyframes in the Dope Sheet Editor only moves them along the time axis (with the Playhead serving as the pivot point); it doesn’t change their values.

The Dope Sheet editor has the following additional menu items:

Slide `Shift-T`

Lets you stretch one set of keyframes across time while compressing an adjacent set to compensate, leaving the combined duration the same.

To use this operator, first select a range of three or more keyframes, then place the mouse cursor somewhere in the middle and press `Shift-T`. The range will be temporarily split in two at the location of the cursor, indicated by a dashed vertical line. If you now move the mouse, the two halves of the range will change in length, and the keyframes within them will move accordingly. Click `LMB` to confirm or `RMB` to cancel.

Keyframe Type `R`

Sets the type of the selected keyframes.

Snap

The toggle button enables/disables automatic keyframe snapping. The dropdown button shows a popover with the following options:

Snap To

Type of element to snap to.

Frame::	Snap to full frames.
Second::	Snap to seconds.
Nearest Marker::	Snap to the nearest Marker.

Absolute Time Snap

When disabled, keyframes will move in increments of *Snap To*. For example, if you selected *Second* and have a keyframe that's currently on 0:06+5, dragging it to the right will snap it to 0:07+5. Its time increases by a second, and its subsecond offset of 5 frames remains the same.

When enabled, keyframes will snap to multiples of *Snap To*. Taking the above example, the keyframe would snap to 0:07+0, removing the subsecond offset.

Proportional Editing

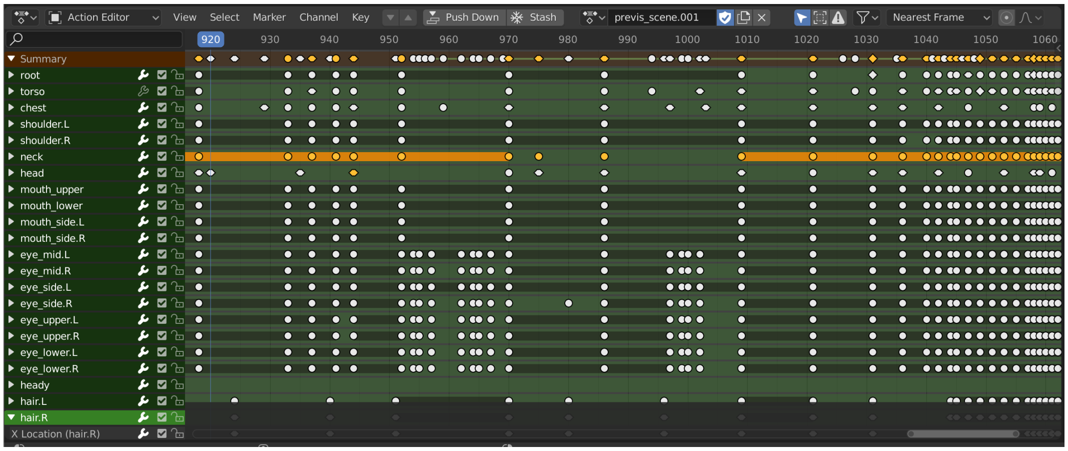
See Proportional Editing.

Modes

- Action Editor
  - Header
- Shape Key Editor
- Grease Pencil
  - Channels Region
  - Header
  - Main Region
  - Sidebar
- Mask

Action Editor

While the *Dope Sheet* mode lets you work with keyframes of many objects at the same time, the *Action Editor* mode focuses on the keyframes inside a single action.


Action Editor
View
Select
Marker
Channel
Key
Push Down
Stash
previs_scene.001
Nearest Frame
920
930
940
950
960
970
980
990
1000
1010
1020
1030
1040
1050
1060
Summary
root
torso
chest
shoulder.L
shoulder.R
neck
head
mouth_upper
mouth_lower
mouth_side.L
mouth_side.R
eye_mid.L
eye_mid.R
eye_side.L
eye_side.R
eye_upper.L
eye_upper.R
eye_lower.L
eye_lower.R
heady
hair.L
hair.R
X Location (hair.R)

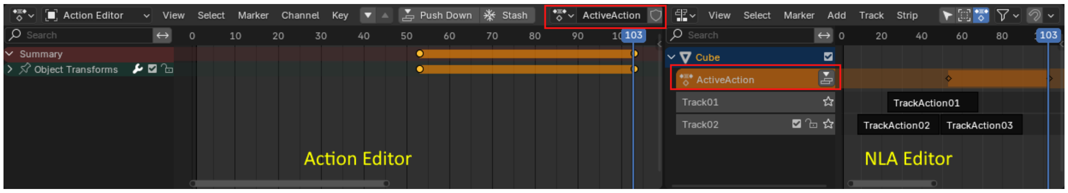
The Action Editor.

An action is a reusable animation segment – a collection of F-curves, where each curve describes how a certain property changes over time. Objects can reference one action as their *active action* and additional ones through Nonlinear Animation tracks.

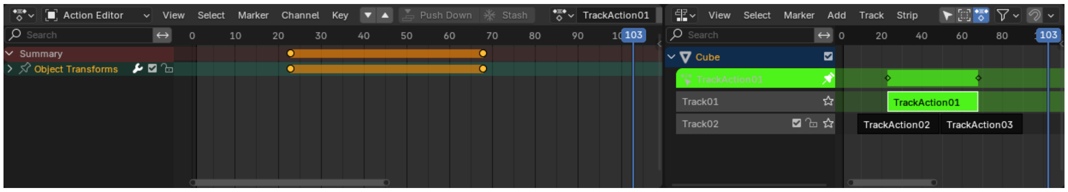
Header

Previous/Next Layer (down/up arrows)

Switches to editing the action in the track below/above the current one, automatically entering or leaving Tweak Mode as necessary. Also transfers the *Disable NLA stack* setting to the *Solo* setting and vice versa (see NLA tracks).


Action Editor
View
Select
Marker
Channel
Key
Push Down
Stash
ActiveAction
Summary
Object Transforms
Cube
Track01
Track02
TrackAction01
TrackAction02
TrackAction03
Add
Track
Strip
Action Editor
NLA Editor

By default, the Action Editor shows the selected object's active action, which is stored in the Action Track at the top.


Action Editor
View
Select
Marker
Channel
Key
Push Down
Stash
TrackAction01
Summary
Object Transforms
Cube
Track01
Track02
TrackAction01
TrackAction02
TrackAction03
Add
Track
Strip

After clicking *Previous Layer*, we enter Tweak Mode for the action in the second track. The NLA Editor highlights it in green, and the Action Editor lets us edit its keyframes.

Push Down (strips with down arrow icon)

Creates a new NLA track below the Action Track and moves the active action into it. This is the same as clicking Push Down Action in the NLA editor.

Stash (snowflake icon)

Creates a new *muted* NLA track at the bottom and moves the active action into it. In effect, this sets the action aside for later use, disabling it so it no longer affects the animation. Later, you can choose to either unmute it again or delete it.

If you click *New Action* in the data-block menu for an object that already has an active action, that previous action will be stashed automatically.

Note

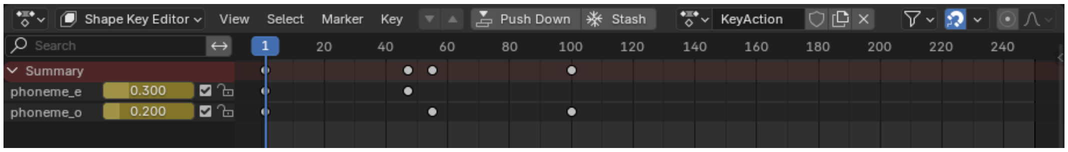
Both *Push Down* and *Stash* leave the object without an active action (meaning the Action Editor becomes empty and the action can no longer be edited). If you still want to make changes to the action, you can select it in the NLA editor and press `Tab` to enter Tweak Mode, or use the Previous/Next Layer buttons as described above.

Action

A data-block menu that lets you change – or clear – the object’s active action.

Shape Key Editor

This mode shows the shape keys of the active object and lets you create/adjust keyframes for their values.


Shape Key Editor
View
Select
Marker
Key
Push Down
Stash
KeyAction
Search
1
20
40
60
80
100
120
140
160
180
200
220
240
Summary

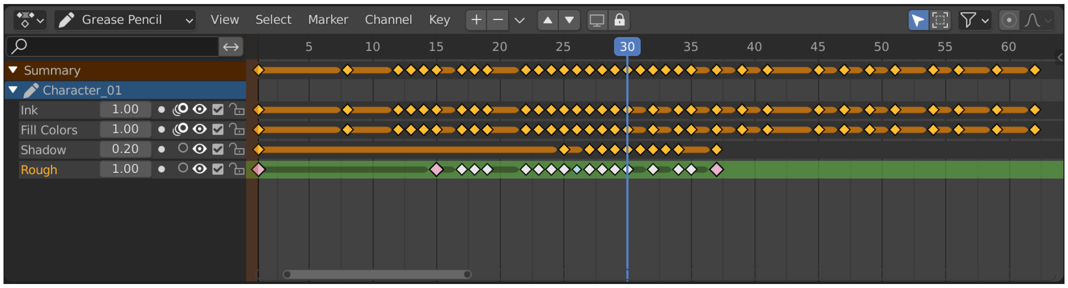
phoneme_e 0.300

phoneme_o 0.200

The Shape Key Editor.

Grease Pencil

This mode lets you adjust the timing of a Grease Pencil object's animation frames. It is especially useful for blocking out shots.


Grease Pencil
View
Select
Marker
Channel
Key
5
10
15
20
25
30
35
40
45
50
55
60
Summary
Character_01

Ink 1.00
Fill Colors 1.00
Shadow 0.20
Rough 1.00

Channels Region

The Channels region shows the Grease Pencil object in light blue and its layers in gray. Layers have the following settings:

Opacity
: The layer's opacity.

Use Mask
: Toggle the layer's masks on or off.

Onion Skinning
: Toggle onion skinning.

Visibility (eye icon)
: Toggle layer visibility in the viewport and in render.

Show all keyframes (checkbox)
: When unchecked, the layer gets frozen in its current state, and moving to a different keyframe will no longer change its appearance.

Lock (padlock)
: Locked layers can't be edited.

Header

Add New Layer
  Adds a layer.

Remove Layer
  Removes the active layer.

Move Layer
  Moves the active layer down/up.

Isolate Layers (screen icon)
  Toggle whether the active layer is the only one that can be edited and is visible.

Isolate Layers (padlock icon)
  Toggle whether the active layer is the only one that can be edited.

Insert Keyframe

You can press `I` while hovering over the Dope Sheet Editor to insert a keyframe. It'll create a copy of the active frame if Additive Drawing is enabled, and a blank frame otherwise.

Copying Frames

It is possible to copy frames from one layer to another, or from object to object, using the *Copy* and *Paste* tools in the *Key* menu. Note that keyframes will be pasted into selected layers, so make sure you have a destination layer selected.

Main Region

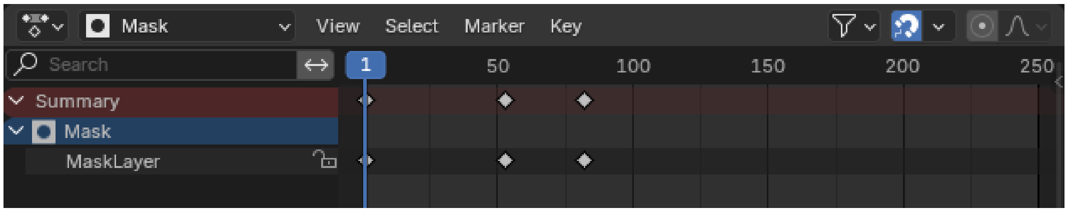
The keyframes can be manipulated like any other data in the *Dope Sheet*. Interpolated keyframes (alias breakdowns) are visualized as smaller light blue points.

Sidebar

The Sidebar contains a copy of the Grease Pencil Layer Properties.

Mask

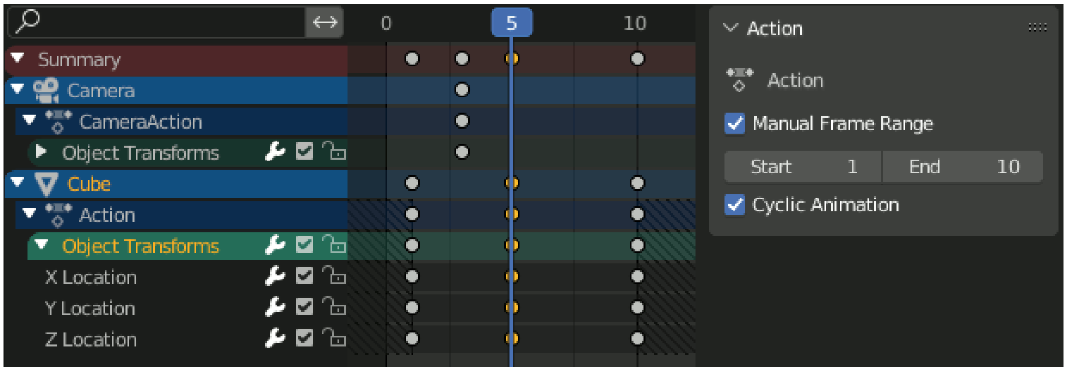
This mode shows all the masks in the blend-file (that have at least one layer) and lets you adjust their keyframes.


Mask
View
Select
Marker
Key
Search
1
50
100
150
200
250
Summary
Mask
MaskLayer

The Mask mode of the Dope Sheet Editor.

Sidebar

Action Panel


0
5
10
Summary
Camera
CameraAction
Object Transforms
Cube
Action
Object Transforms
X Location
Y Location
Z Location

Action

Action

☑ Manual Frame Range

Start 1 End 10

☑ Cyclic Animation

Actions with and without a Manual Frame Range in Dope Sheet.

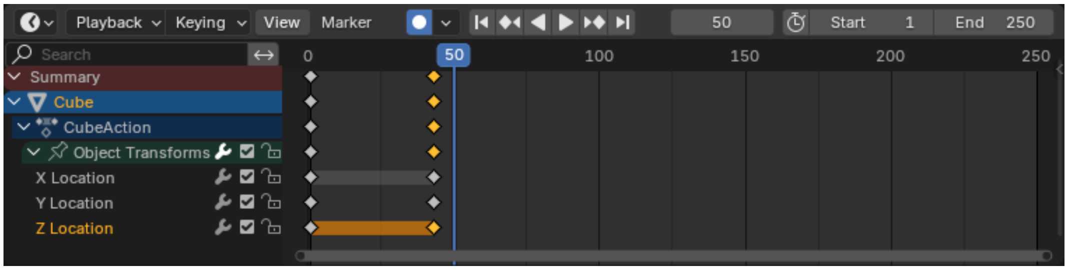
When the editor is in Action Editor mode, or in Dope Sheet mode with a channel selected that belongs to an action, this panel allows changing some settings of that action. See Action Properties for details.

Custom Properties

Create and manage your own properties to store data in the action's data block. See the Custom Properties page for more information.

Timeline

The *Timeline* editor is used to jump to different frames, manipulate keyframes, and control animation playback.


Playback
Keying
View
Marker
50
Start
1
End
250
Search
0
50
100
150
200
250
Summary
Cube
CubeAction
Object Transforms
X Location
Y Location
Z Location

The Timeline.

Main View

The X axis represents time, with the numbers 0/50/100/… being frame numbers. The blue line is the *Playhead* indicating the current frame, and the diamond shapes are *Keyframes*, points where you specified a certain value for a certain property at a certain time.

Adjusting the View

Panning is done by dragging `MMB`.

Zooming is done by dragging `Ctrl-MMB`, rolling the mouse `Wheel`, or pressing `NumpadMinus`/`NumpadPlus`.

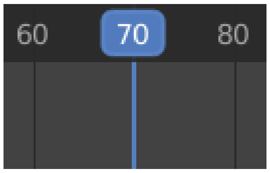
You can also use the scrollbars located at the bottom and the right of the editor.

Playhead

The *Playhead* is the blue vertical line showing the current frame number.

It can be moved to a new position by clicking or dragging `LMB` in the scrubbing area at the top.

You can also move it in single-frame increments by pressing `Left` or `Right`, or jump to the beginning or end frame by pressing `Shift-Left` or `Shift-Right`.



Playhead.

Frame Range

The *Frame Range* determines the length of the scene's animation. By default, it's set to start at frame 1 and end at frame 250. You can change this using the Start/End inputs in the Timeline header, or in the [Output Properties](#).

Keyframes

By default, the timeline only shows keyframes for selected items. You can make it show all keyframes by unchecking *View ‣ Only Show Selected*.

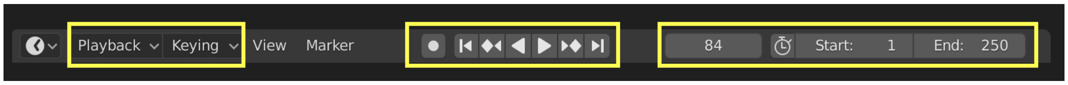
You can click a keyframe to select it (and deselect all others), or click it while holding `Shift` to add it to the selection (or remove it if it was already selected). You can also drag a box to select multiple keyframes in one go.

To move the selected keyframes, simply drag one of them. Alternatively, you can press `G`, move the mouse, and click `LMB` to confirm (or `RMB` to cancel). You can also press `S` to scale the keyframes in relation to the Playhead.

Markers

See the [Markers page](#) for more information.

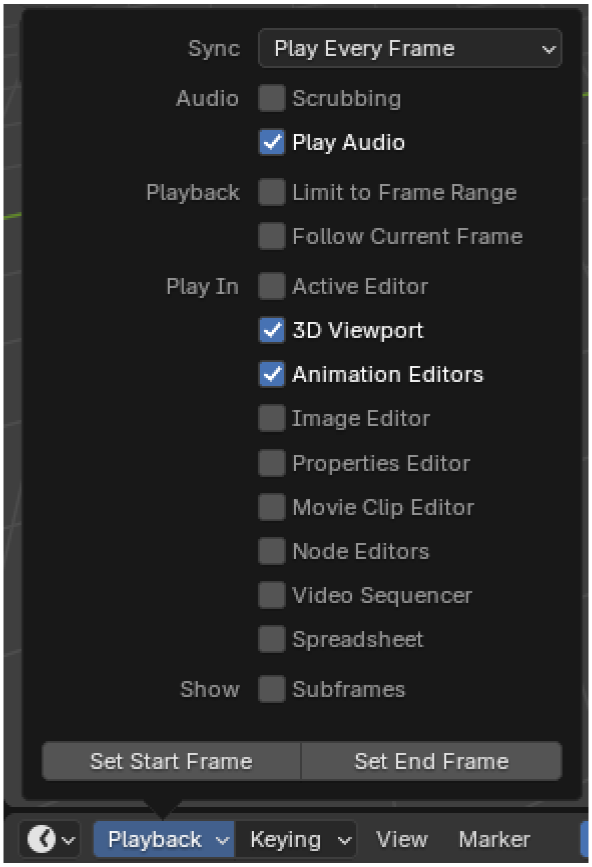
Header



Popovers for Playback and Keying; transport controls; and frame controls

Popovers

Playback Popover



Sync: Play Every Frame

Audio: ☐ Scrubbing

☑ Play Audio

Playback: ☐ Limit to Frame Range

☐ Follow Current Frame

Play In: ☐ Active Editor

☑ 3D Viewport

☑ Animation Editors

☐ Image Editor

☐ Properties Editor

☐ Movie Clip Editor

☐ Node Editors

☐ Video Sequencer

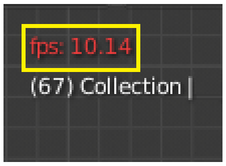
☐ Spreadsheet

Show: ☐ Subframes

Set Start Frame
Set End Frame
Playback
Keying
View
Marker

Sync

If animation playback can’t keep up with the desired [Frame Rate](), the actual frame rate (shown in the top left corner of the 3D Viewport) will turn red, and the *Sync* option determines how the situation should be handled.



fps: 10.14
(67) Collection |

3D Viewport red FPS.

Play Every Frame

Play every frame, even if this results in the animation playing slower than intended.

Frame Dropping

Drop frames if playback becomes slower than the scene's frame rate.

Sync to Audio

Drop frames if playback becomes too slow to remain synced with audio.

Audio

Scrubbing

Play bits of the sound in the animation (if there is any) while you drag the Playhead around.

Play Audio

Uncheck to mute all sound.

Playback

Limit to Frame Range

Don't allow moving the Playhead outside of the Frame Range using the mouse.

Follow Current Frame

Automatically pan the view to catch up when the Playhead goes off screen.

Play In

Which editors to update on each animation frame. If an editor is unchecked, it'll only be updated once playback stops (with some exceptions where it'll update on each frame anyway). When starting playback in either the Graph Editor, Dope Sheet or the NLA Editor, all editors will play back regardless of the settings. This is a feature requested by animators to easily play back all views.

Show

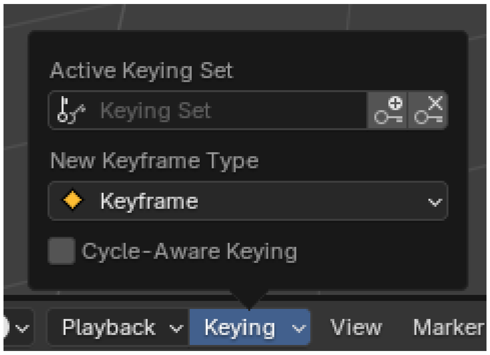
Subframes

Display and allow changing the current scene subframe.

Set Start/End Frame

Set the scene's start/end frame to the current frame. If the Preview Range is active (see Frame Controls), that one is changed instead.

Keying Popover


Active Keying Set

Keying Set

New Keyframe Type

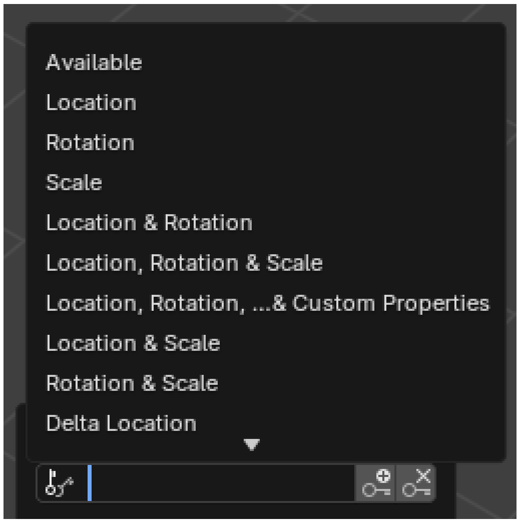
Keyframe

☐ Cycle-Aware Keying
Playback
Keying
View
Marker

The *Keying* popover contains options that affect keyframe insertion.

Active Keying Set

A *Keying Set* is a named collection of animatable properties. If you select one and then press `I` while not hovering over any input field, Blender will create keyframes for the properties in that keying set.


Available
Location
Rotation
Scale
Location & Rotation
Location, Rotation & Scale
Location, Rotation, ...& Custom Properties
Location & Scale
Rotation & Scale
Delta Location

Timeline Keying Sets.

If you don't have a keying set selected, you'll get keyframes on a default set of properties instead (e.g. Location/Rotation/Scale for objects).

There are a number of predefined keying sets, but you can also create your own in the Keying Sets panel.

Insert Keyframes `I`

Insert keyframes on the current frame.

Delete Keyframes `Alt-I`

Delete keyframes on the current frame.

New Keyframe Type

The keyframe type for newly created keyframes.

Cycle-Aware Keying

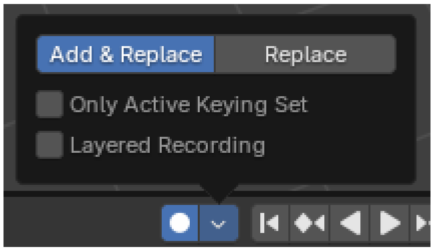
When inserting keyframes into trivially cyclic curves, special handling is applied to preserve the cycle integrity (most useful while tweaking an established cycle):

- If a key insertion is attempted outside of the main time range of the cycle, it is remapped back inside the range.
- When overwriting one of the end keys, the other one is updated accordingly.

In addition, when adding a new curve into an action with a Manual Frame Range and *Cyclic Animation* enabled, the curve is automatically made cyclic with the period matching the frame range. For convenience, this check and conversion is also done before adding the second keyframe to such a curve.

Auto Keying

When the record button () is enabled, Blender will automatically create keyframes on the current frame whenever you transform an object or bone in the 3D Viewport (or change one of its transform properties in the Properties Editor).



Auto Keying button.

One special use case is to record a camera path as you fly through the scene. See Fly/Walk Navigation.

Note

Auto Keying only works for transform properties (Location, Rotation, Scale). It won't create a keyframe if you change, say, the color of a material – you still have to do that manually.

Mode

Add & Replace

Add or replace keyframes as needed.

Replace

Only replace existing keyframes.

Only Active Keying Set

By default, Auto Keying will create keyframes even for properties that are not in the active keying set. Use this checkbox to change that.

Layered Recording

Adds a new NLA Track for every pass made over the animation to allow non-destructive tweaking.

Menus

View Menu

Adjust Last Operation

Displays a pop-up panel to alter properties of the last completed operation. See Adjust Last Operation.

Channels

Show or hide the Channels region (the tree of objects and animatable properties on the left).

Frame All `Home`

Pans and zooms the view so that all keyframes are visible.

Frame Scene/Preview Range

Reset the horizontal view to the current scene frame range, taking the preview range into account if it is active.

Go to Current Frame `Numpad0`

Centers the Timeline to the Playhead.

Show Markers

Shows the Markers region (if any markers are defined). When disabled, the Marker Menu is also hidden and marker operators are not available in this editor.

Show Seconds `Ctrl-T`

Shows the time on the X axis and the *Playhead* as timestamps instead of frame numbers. A timestamp such as `01:03+02` means “1 minute, 3 seconds, 2 frames.”

Sync Visible Range

Synchronizes the horizontal panning and scale of the editor with other time-based editors that also have this option enabled. That way, they always show the same section of time.

Only Show Selected

Only show keyframes related to the selected items. This could be objects, bones, nodes, and so on.

Note

If this option is enabled, the Timeline may not show all material keyframes of the selected objects. Instead, it only shows the keyframes belonging to the selected nodes in the Shader Editor.

Only Show Errors

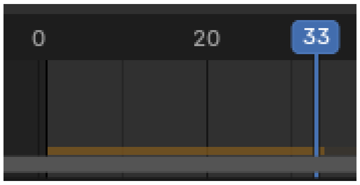
Only show curves and drivers that are disabled or have errors. Useful for debugging.

Cache

Show Cache

Which simulation caches to show on the timeline.

Baked simulations will be shown as fully opaque, cached simulations will be slightly transparent, and invalid caches will be slightly transparent with dark diagonal stripes.



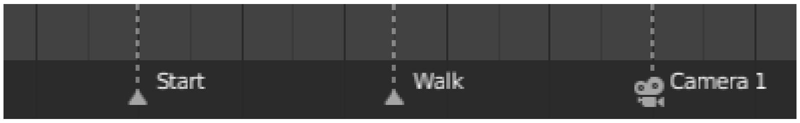
Timeline Cache.

Area

Area controls. See the user interface documentation for more information.

Marker Menu

Markers are used to denote frames with key points or significant events within an animation. Like in most animation editors, they're shown at the bottom of the Timeline.

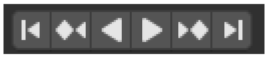


Markers in an animation editor.

For descriptions of the different marker tools, see Editing Markers.

Transport Controls

These buttons are used to set the current frame and control playback.



Transport controls.

Jump to Start `Shift-Left`
Sets the Playhead to the start of the frame range.

Jump to Previous Keyframe `Down`
Moves the Playhead to the previous keyframe.

Rewind `Shift-Ctrl-Spacebar`
Starts playing the animation in reverse.

Play `Spacebar`
Starts playing the animation.

Jump to Next Keyframe `Up`
Moves the Playhead to the next keyframe.

Jump to End `Shift-Right`
Sets the Playhead to the end of the frame range.

Pause `Spacebar`
Stops playing the animation.

Frame Controls

Current Frame `Alt-Wheel`
The number of the frame that's currently being displayed in the 3D Viewport. This is also the location of the Playhead.

Use Preview Range
The Preview Range is an alternative Frame Range that you can use for focusing on a particular part of the animation. It lets you repeatedly play a short segment without having to manually rewind or change the frame range of the entire scene.

This range only affects the preview in the 3D Viewport; it doesn't affect rendering.

The boundaries of the Preview Range are shown in dark orange. You can quickly configure and enable it by pressing `P` and dragging a box.

To disable it, you can press `Alt-P`.

Start/End Frame

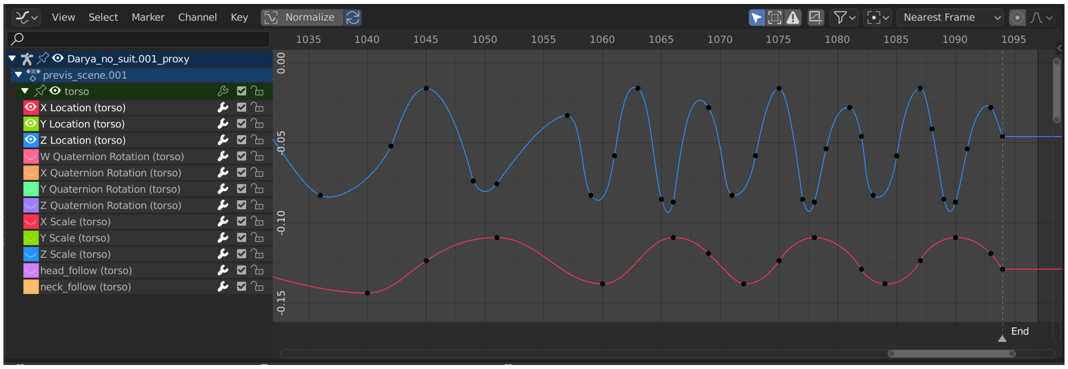
The start/end frame of the scene (or the preview range, if active).

Graph Editor

- Introduction
    - Main Region
    - Header
    - Sidebar Region
- Channels
    - Introduction
    - Editing
- F-Curves
    - Introduction
    - Editing
    - Properties
    - F-Curve Modifiers

Introduction

The Graph Editor lets you edit animation curves, which determine how properties change over time.


View
Select
Marker
Channel
Key
Normalize
Nearest Frame
1035
1040
1045
1050
1055
1060
1065
1070
1075
1080
1085
1090
1095
Darya_no_suit.001_proxy
previs_scene.001
torso
X Location (torso)
Y Location (torso)
Z Location (torso)
W Quaternion Rotation (torso)
X Quaternion Rotation (torso)
Y Quaternion Rotation (torso)
Z Quaternion Rotation (torso)
X Scale (torso)
Y Scale (torso)
Z Scale (torso)
head_follow (torso)
neck_follow (torso)
0.00
-0.05
-0.10
-0.15
End

The Graph Editor.

Main Region

The curve view allows you to view and edit F-Curves. An F-Curve has several key parts:

Curve

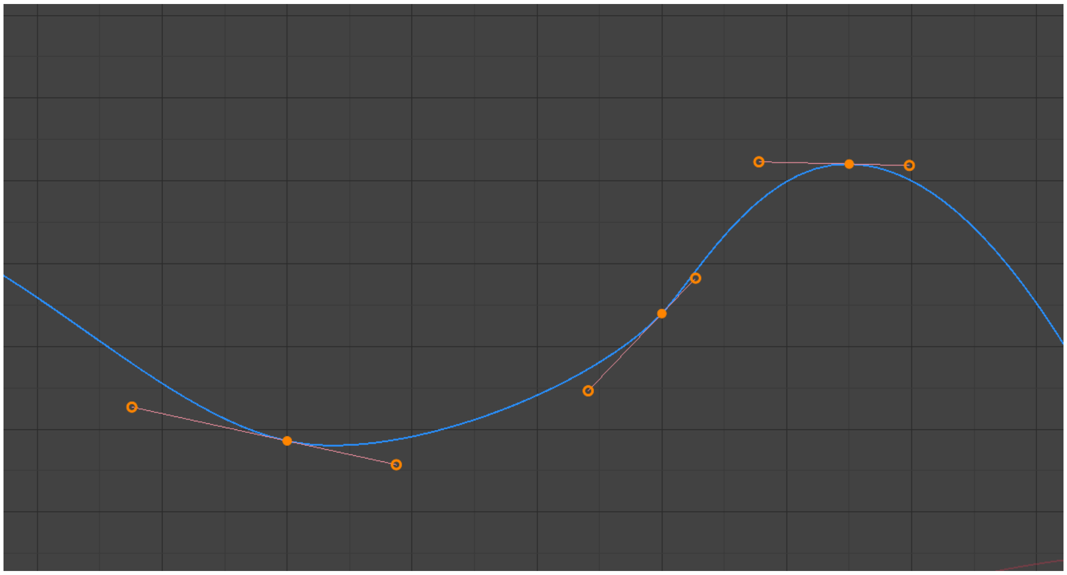
The curve describes how the value of a property (Y axis) evolves over time (X axis).

Keyframes

Keyframes are user-defined values on certain frames and are represented by little black discs that become orange when selected. The values on the other frames are calculated automatically by interpolating between these keyframes.

Handles

Each keyframe has two handles – points that can be dragged around to influence the shape of the curve around it.



A simple curve. The discs are keyframes, and the circles are their handles.

See also

See F-Curves for more info.

Navigation

As with most editors, you can:

Pan
: Pan the view by dragging with `MMB`.

Zoom
: Zoom in and out with the mouse `Wheel`.

Scale View
: Scale the view horizontally or vertically by dragging with `Ctrl-MMB`.

You can also use the scrollbars.

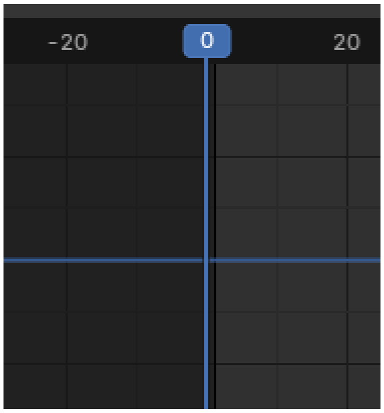
Tip

You can focus the view on the curve of an animated property by right clicking it and choosing *View in Graph Editor*. If you want to set up a hotkey for this, you need to open the Keymap preferences, open the *User Interface* category, click *Add New*, fill in the operator name `anim.view_curve_in_graph_editor`, and finally choose a shortcut. Normally this can be done more easily by right clicking the context menu item and choosing *Assign Shortcut*, but in this case, the shortcut would be added to the wrong category and not work.

Playhead & 2D Cursor

The current frame is represented by a vertical blue line called the *Playhead*. As in the Timeline, you can move it by clicking or dragging with `LMB` in the scrubbing area at the top.

Combined with the horizontal blue line, the Playhead forms the *2D Cursor* which can be used as a pivot point for rotating and scaling. You can disable the horizontal line using *View* ‣ *Show Cursor* or *Sidebar* ‣ *View* ‣ *Show Cursor*.



Graph Editor 2D Cursor.

The 2D Cursor can be moved by clicking or dragging with `Shift-RMB` or by adjusting its coordinates in the View tab of the Sidebar.

Header

View Menu

Sidebar `N`

Shows or hides the Sidebar Region.

Adjust Last Operation

Displays a pop-up panel to alter properties of the last completed operation. See Adjust Last Operation.

Channels

Shows or hides the Channels Region.

Frame Selected `NumpadPeriod`

Pans and zooms the view to focus on the selected keyframes.

Frame All `Home`

Pans and zooms the view to show all keyframes.

Frame Scene/Preview Range

Reset the horizontal view to the current scene frame range, taking the preview range into account if it is active.

Go to Current Frame `Numpad0`

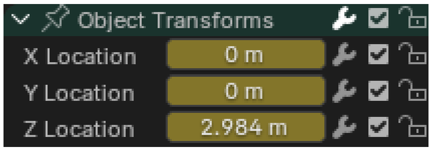
Centers the area to the Playhead.

Realtime Updates

Whether to update other views (such as the 3D Viewport) while you're moving keyframes around. If disabled, the other views only get updated once you finish the move.

Show Sliders

Shows a value slider next to each channel. Adjusting such a slider automatically creates a keyframe.



Object Transforms
X Location 0 m
Y Location 0 m
Z Location 2.984 m

Sliders.

Auto-Merge Keyframes

Automatically merge keyframes that end up on the same frame after transformation.

Auto-Lock Key Axis

Automatically locks the movement of keyframes to the axis that best matches the direction of the mouse cursor.

Show Markers

Shows the marker region. When disabled, the Marker Menu is also hidden and marker operators are not available in this editor.

Show Cursor

Toggles the visibility of the horizontal blue line (see Playhead & 2D Cursor).

Show Seconds `Ctrl-T`

Show timing in seconds instead of frames. As an example, the timestamp `01:03+02` means “1 minute, 3 seconds, 2 frames.”

Sync Visible Range

Synchronizes the horizontal panning and scale of the editor with other time-based editors that also have this option enabled. That way, they always show the same section of time.

Show Extrapolation

Toggles the visibility of the extrapolated portion of curves.

Show Handles `Ctrl-H`

Toggles the display of keyframe handles.

Only Selected Keyframes Handles

Only shows the handles for the selected keyframes.

Set Preview Range `P`

Lets you drag a box to define a time range for previewing. As long as this range is active, playback will be limited to it, letting you repeatedly view a segment of the animation without having to manually rewind each time.

You can change the start or end frame using the corresponding button in the Timeline editor’s Playback popover. Alternatively, you can simply run *Set Preview Range* again.

Clear Preview Range `Alt-P`

Clears the preview range.

Set Preview Range to Selected `Ctrl-Alt-P`

Applies a preview range that encompasses the selected keyframes.

Toggle Dope Sheet

Changes the area's editor to the Dope Sheet Editor.

Area

Area controls. See the user interface documentation for more information.

Select Menu

All `A`

Selects all keyframes and handles.

None `Alt-A`

Clears the selection.

Invert `Ctrl-I`

Inverts the selection.

Box Select `B`

Lets you drag a box and selects the keyframes and handles inside it.

Box Select (Axis Range) `Alt-B`

Lets you drag a box and selects the keyframes and handles inside the corresponding time range, even if they're above or below the box.

Box Select (Include Handles)

Selects keyframes and their handles inside the defined box.

Circle Select `C`

Displays a circle around the cursor, which you can drag over keyframes and handles to select them.

Lasso Select `Ctrl-RMB`

Lets you draw a freehand shape and selects the keyframes and handles inside it.

Columns on Selected Keys `K`

Selects keys that are on the same frame as a key that's already selected.

Column on Current Frame `Ctrl-K`

Selects all the keys that are on the current frame.

Columns on Selected Markers `Shift-K`

Selects keys that are on the same frame as a selected marker.

Between Selected Markers `Alt-K`

Selects keys that lie between the leftmost and rightmost selected markers.

Before Current Frame `[`

Select the keys that lie before (or on) the current frame. You can also click `Shift-Ctrl-LMB` anywhere to the left of the Playhead.

After Current Frame `]`

Select the keys that lie after (or on) the current frame. You can also click `Shift-Ctrl-LMB` anywhere to the right of the Playhead.

Select Handles

Selects the handles of the currently selected keyframes.

Select Keys

Selects the keyframes of the currently selected handles.

Select More `Ctrl-NumpadPlus`

Expands the selection to include the neighbors (in time) of the currently selected keys.

Select Less `Ctrl-NumpadMinus`

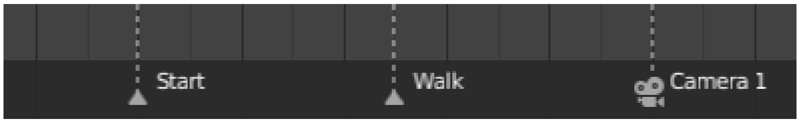
Deselects keyframes with fewer than two selected neighbors.

Select Linked

Selects keys that are on the same curve as a key that's already selected.

Marker Menu

Markers are used to denote frames with key points or significant events within an animation. Like with most animation editors, they're shown at the bottom.



Markers in animation editor.

For descriptions of the different marker tools, see Editing Markers.

Channel Menu

See Editing Channels.

Key Menu

See Editing F-Curves.

Normalize

Scales the display of each curve so that they all (appear to) occupy the same value range, going from -1 to 1. This can make editing easier when you're working with curves whose value ranges are far apart.

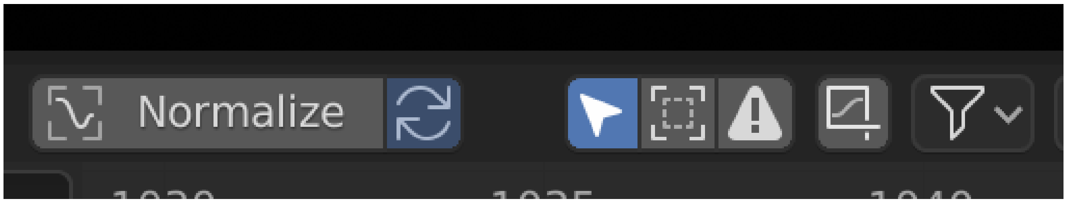
When you enable this option, the view is zoomed accordingly and the area outside the normalized value range is darkened.

If a preview range is defined, keyframes within the range are normalized, while the others are scaled proportionally.

Auto Normalization

Automatically recalculate curve normalization on every curve edit.

View Controls



View controls.

Show Only Selected
    Only show curves belonging to objects/bones/… that are selected.

Show Hidden
    Show keyframes from objects/bones/… that are hidden.

Show Only Errors
    Only show channels that have errors (for example, because they try to animate a property that doesn't exist on the object).

Create Ghost Curves (framed F-Curve icon)
    Creates a snapshot of the current curves and shows it in the background so that you can use it as a reference. Click the button again to clear the snapshot.

Filter (funnel icon)

Search
Filters the channel list by a search term.

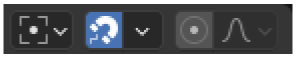
Filtering Collection
Select a collection to only show keyframes from objects in that collection.

Filter by Type
Filter curves by property type.

Sort Data-Blocks
Sorts data-blocks alphabetically to make them easier to find.

If your playback speed suffers because of this (should only really be an issue when working with lots of objects), you can turn it off.

Transform Controls



Transform controls.

Pivot Point
Pivot point for rotating and scaling.

Bounding Box Center
Center of the smallest possible box around the selected keyframes.

2D Cursor
The intersection between the Playhead and the horizontal Cursor line.

Individual Centers
Rotate/scale each handle around its keyframe.

Snap

The icon toggles snapping on or off. The dropdown offers the following options:

Snap To
: Type of element to snap to.

  Frame
  : Snap to full frames.

  Second
  : Snap to seconds.

  Nearest Marker
  : Snap to the nearest Marker.

Absolute Time Snap
: When disabled, keyframes will move in increments of *Snap To*. For example, if you selected *Second* and have a keyframe that's currently on 0:06+5, dragging it to the right will snap it to 0:07+5. Its time increases by a second, and its subsecond offset of 5 frames remains the same.

  When enabled, keyframes will snap to multiples of *Snap To*. Taking the above example, the keyframe would snap to 0:07+0, removing the subsecond offset.

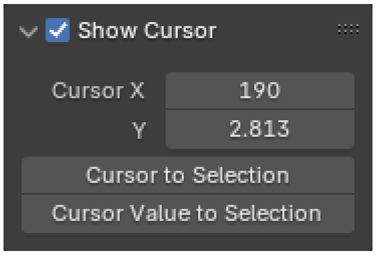
Proportional Editing `O`
: See Proportional Editing.

Sidebar Region

View Tab

Show Cursor
: Toggles the visibility of the 2D Cursor's horizontal line.

Cursor X, Y



☑ Show Cursor

Cursor X 190

Y 2.813

Cursor to Selection
Cursor Value to Selection

View Tab.

Shows, and lets you change, the X coordinate (current frame) and Y coordinate (value) of the 2D Cursor.

Cursor to Selection

Places the 2D Cursor at the average time and value of the selected keyframes.

Cursor Value to Selection

Places the 2D Cursor at the average value of the selected keyframes, leaving its time unchanged.

F-Curve Tab

See F-Curve Properties.

Modifiers Tab

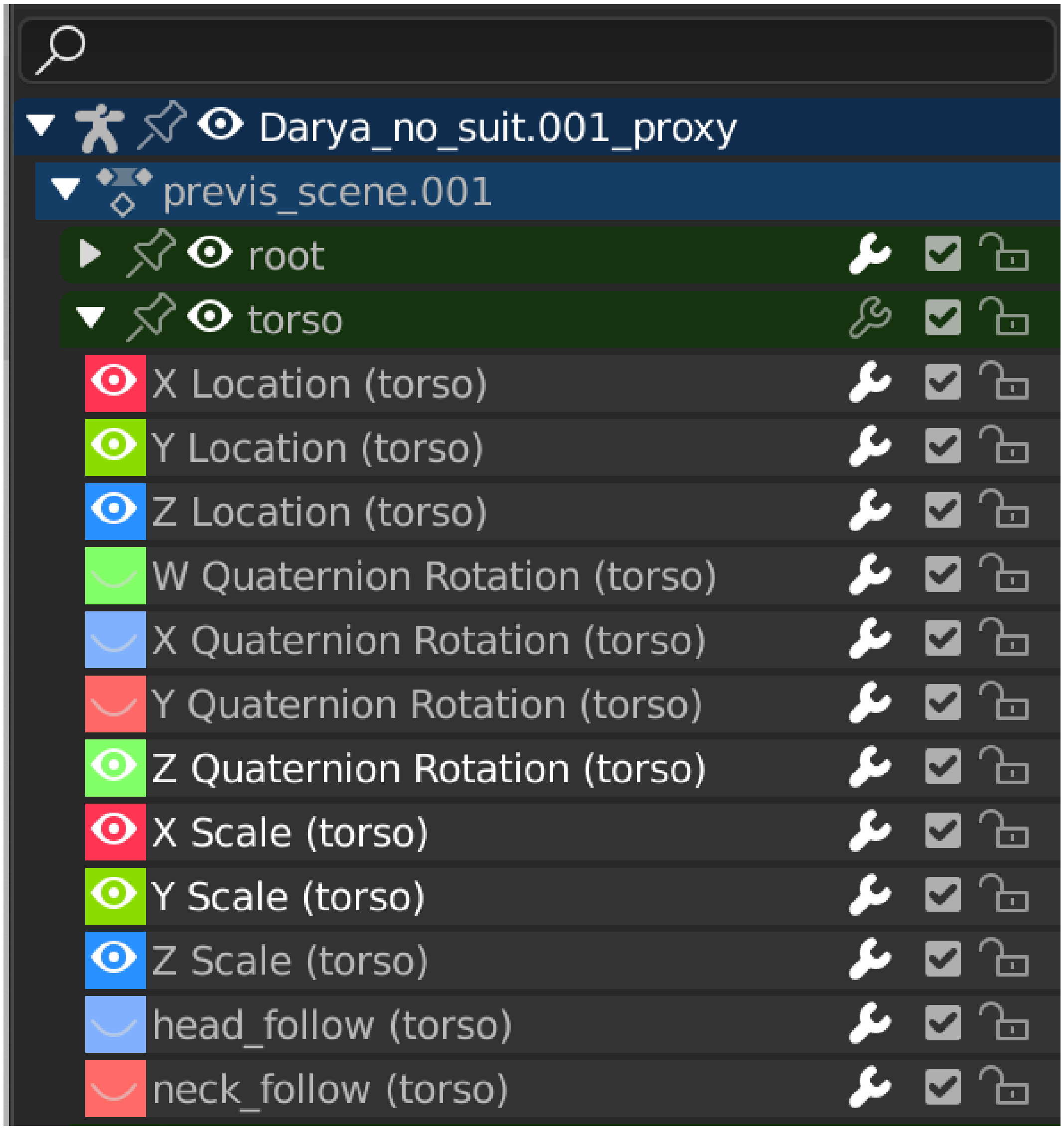
See F-Curve Modifiers.

Channels

- Introduction
    - Channels Region
- Editing
    - Delete Channels
    - Un/Group Channels
    - Toggle/Enable/Disable Channel Settings
    - Toggle Channel Editability
    - Extrapolation Mode
    - Add F-Curve Modifier
    - Show/Hide
    - Expand/Collapse Channels
    - Move
    - Revive Disabled F-Curves
    - Keys to Samples
    - Samples to Keys
    - Sound to Samples
    - Bake Channels
    - Discontinuity (Euler) Filter
    - Frame Selected Channels

Introduction

Channels Region


Darya_no_suit.001_proxy
previs_scene.001
root
torso
X Location (torso)
Y Location (torso)
Z Location (torso)
W Quaternion Rotation (torso)
X Quaternion Rotation (torso)
Y Quaternion Rotation (torso)
Z Quaternion Rotation (torso)
X Scale (torso)
Y Scale (torso)
Z Scale (torso)
head_follow (torso)
neck_follow (torso)

The Channels region.

This region is found on the left side of time-based editors like the Timeline, the Dope Sheet Editor, and the Graph Editor. It shows a tree of items (objects, bones…) and their animated properties, with the latter also being called “channels.” Each channel has an associated F-curve describing how its value changes over time.

The rows are color-coded as follows:

- Dark blue: scenes, objects
- Light blue: actions, shape keys etc.
- Green: channel groups
- Gray: channels

Search `Ctrl-F`

Lets you filter the channels by typing a part of their name. Click the Invert button to instead show channels that *don’t* include the search text.

Controls

The headers contain the following toggle buttons:

Pin (pin icon)

Keep the row and its children visible even when selecting a different object.

Hide (eye icon)

Hides the keyframes and curve associated with the channel.

Modifiers (wrench icon)

Deactivates the modifiers of the curve.

Mute (checkbox)

Deactivates the curve, making the animation behave as though it doesn’t exist.

Lock `Tab` (padlock icon)

Prevent the curve from being edited.

Note

This also works in the Nonlinear Animation Editor, but note that it only locks the strips there, not the underlying F-curves.

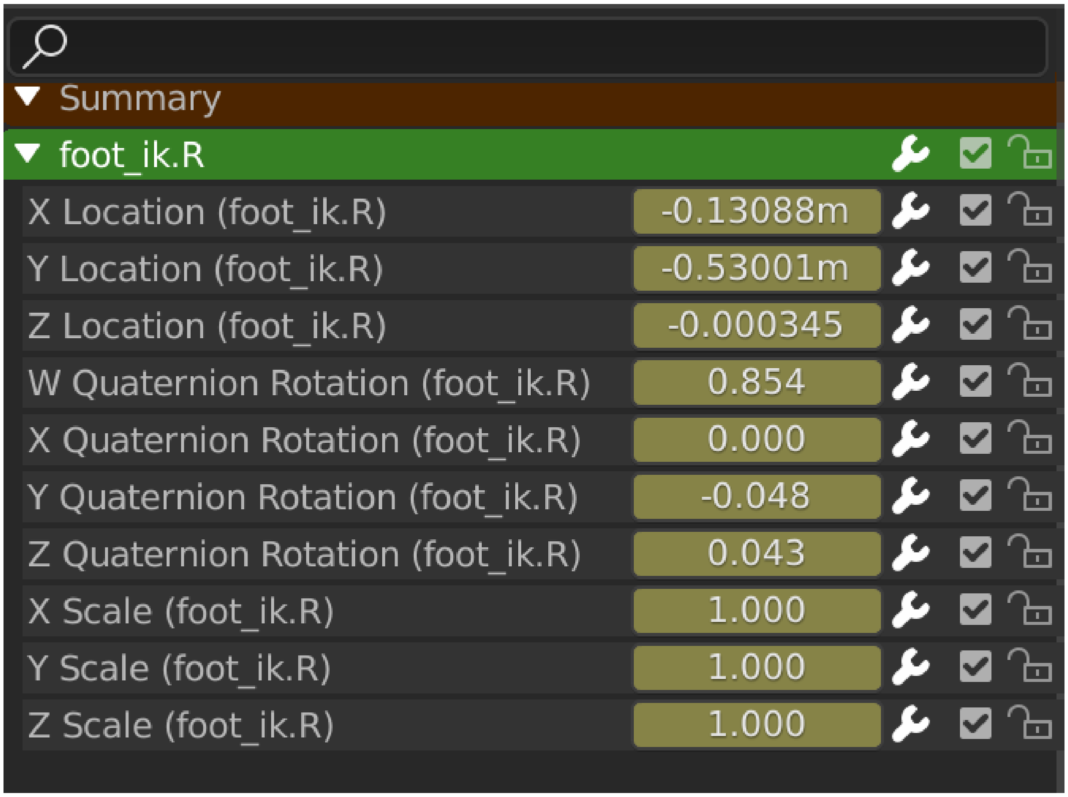
Selection

- Select single header: click `LMB`
- Add/Remove single header to/from selection: click `Ctrl-LMB`
- Select range: click `Shift-LMB`
- Select All: `A`
- Deselect All: press `Alt-A` or double-tap `A`
- Box Select: drag `LMB`
- Box Add: drag `Shift-LMB`
- Box Remove: drag `Ctrl-LMB`
- Select all keyframes in the channel: double-click `LMB` on its header.

Editing

- Rename (anything but a channel): double-click `LMB`
- Delete selected: `X` or `Delete`
- Lock selected: `Tab`

Sliders



Summary

foot_ik.R

X Location (foot_ik.R)	-0.13088m
Y Location (foot_ik.R)	-0.53001m
Z Location (foot_ik.R)	-0.000345
W Quaternion Rotation (foot_ik.R)	0.854
X Quaternion Rotation (foot_ik.R)	0.000
Y Quaternion Rotation (foot_ik.R)	-0.048
Z Quaternion Rotation (foot_ik.R)	0.043
X Scale (foot_ik.R)	1.000
Y Scale (foot_ik.R)	1.000
Z Scale (foot_ik.R)	1.000

The Action editor showing sliders.

If you enable *View* ‣ *Show Sliders*, the region will show a value slider next to each channel. Changing such a slider will change the value of the curve at the current frame, creating a keyframe if one doesn't already exist.

Editing

Delete Channels

Reference

Menu::	*Channel ‣ Delete Channels*
Shortcut::	`Delete`, `X`

Removes the selected channels from the current action.

Warning

Make sure the mouse cursor is hovering over the channel region before using the keyboard shortcuts. If it's hovering over the main region, you'll only delete the selected keyframes, not the full channels.

Un/Group Channels

Reference

Menu::	*Channel ‣ Un/Group Channels*
Shortcut::	`Ctrl-Alt-G`, `Ctrl-G`

Un/Groups the selected channels into a collection that can be renamed by double-clicking its name. Grouping channels helps keep the view more organized.

Toggle/Enable/Disable Channel Settings

Reference

Menu:: *Channel ▸ Toggle/Enable/Disable Channel Settings*
Shortcut:: `Shift-W`, `Shift-Ctrl-W`, `Alt-W`

Toggles, enables, or disables a certain setting for the selected channels:

Protect
: When a channel is protected (closed padlock icon), it can’t be edited. Instead of pressing `Shift-W` and selecting *Toggle*, you can also simply press `Tab`.

Mute
: When a channel is muted (empty checkbox), it doesn’t affect the animation.

Toggle Channel Editability

Reference

Menu:: *Channel ▸ Toggle Channel Editability*
Shortcut:: `Tab`

Locks or unlocks a channel for editing.

Extrapolation Mode

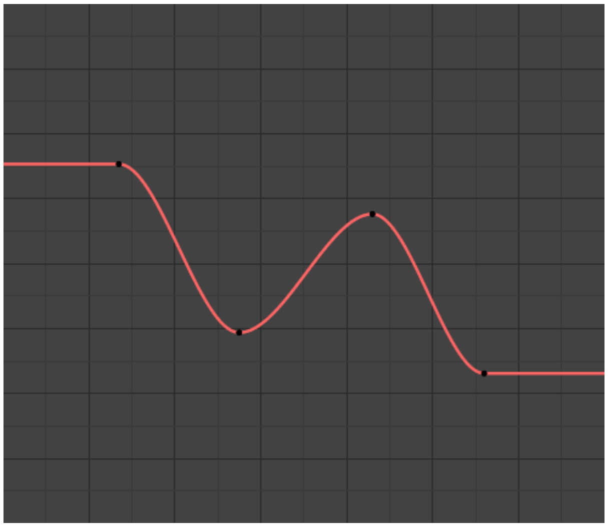
Reference

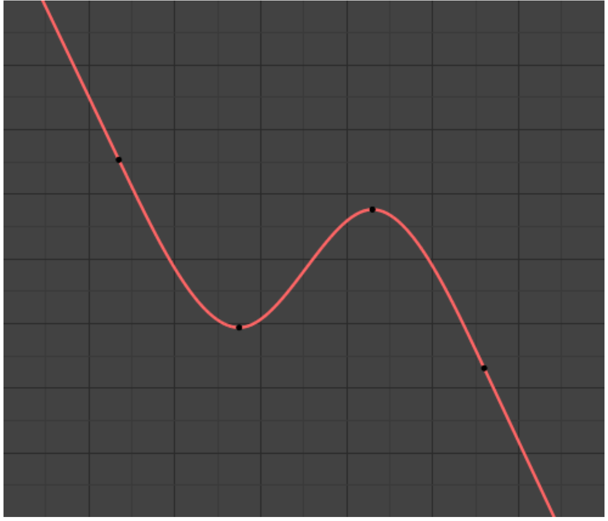
Menu:: *Channel ▸ Extrapolation Mode*
Shortcut:: `Shift-E`

Changes how the curve behaves before its first keyframe and after its last keyframe.

Constant:: Continue in a straight line, keeping the same value as the first/last keyframe. This is the default.

Linear::


Constant extrapolation.


Linear extrapolation.

Continue in a straight line, keeping the same slope as on the first/last keyframe.

Make Cyclic:: Repeat the whole curve. This works by adding a Cycles modifier.

Clear Cyclic:: Remove the above modifier, making the curve non-repeating again.

Add F-Curve Modifier

Reference

Menu::	*Channel ‣ Add F-Curve Modifier*
Shortcut::	`Shift-Ctrl-M`

Shows a submenu from where you can add a modifier to the active curve. Settings for these modifiers can be found in *Sidebar ‣ Modifiers*.

Show/Hide

Hide Selected Curves `H`
    Hides the selected curves.

Hide Unselected `Shift-H`
    Hides all curves except the selected ones.

Reveal Curves `Alt-H`
    Shows all previous hidden curves.

Expand/Collapse Channels

Reference

Menu::	*Channel ‣ Expand/Collapse Channels*
Shortcut::	`NumpadPlus`, `NumpadMinus`

Expands or collapses the selected headers.

Move

Reference

Menu::	*Channel ‣ Move…*

Lets you reorder the selected channels in the list:

- To the top `Shift-PageUp`

- Up one line `PageUp`
- Down one line `PageDown`
- To the bottom `Shift-PageDown`

Revive Disabled F-Curves

Reference

Menu::	*Channel ‣ Revive Disabled F-Curves*

Clears the “disabled” tag from all F-Curves to get broken F-Curves working again. (A curve is broken if it references a property that doesn’t exist.)

Keys to Samples

Reference

Menu::	*Channel ‣ Keys to Samples*
Shortcut::	`Alt-C`

Switches the selected curves from interpolating between a set of keyframes to using a sampled value at each full frame. **This is a destructive process that removes the ability to edit the curve.** It’s mainly used to reduce the file size with large datasets, as samples take up less space than keyframes.

Between samples (on subframes), the curve interpolates linearly.

Samples to Keys

Reference

Menu::	*Channel ‣ Samples to Keys*

Switches the selected curves from using samples to using keyframes, making them editable. Note that this creates a keyframe on every frame.

Sound to Samples

Reference

Menu:: *Channel ‣ Sound to Samples*

Creates a sampled curve based on a sound file. Use *Samples to Keys* if you need to edit it.

Lowest Frequency
Cutoff frequency of a high-pass filter that is applied to the audio data.

Highest Frequency
Cutoff frequency of a low-pass filter that is applied to the audio data.

Attack Time
Value for the hull curve calculation that tells how fast the hull curve can rise. The lower the value, the steeper it can rise.

Release Time
Value for the hull curve calculation that tells how fast the hull curve can fall. The lower the value, the steeper it can fall.

Threshold
Minimum amplitude value needed to influence the hull curve.

Accumulate
Only the positive differences of the hull curve amplitudes are summarized to produce the output.

Additive
The amplitudes of the hull curve are summarized. If *Accumulate* is enabled, both positive and negative differences are accumulated.

Square

Gives the output as a square curve. Negative values always result in -1, and positive ones in 1.

Square Threshold

All values lower than this threshold result in 0.

Bake Channels

Reference

Menu:: *Channel ‣ Bake Channels*

Generates new keyframes for the selected curves.

Frame Range

The range that will be baked. Defaults to the scene range or preview range.

Frame Step

Distance between keyframes. Can be used to create a keyframe every 10 frames or even every half frame.

Remove Outside Range

Removes existing keys outside the specified baking range.

Interpolation Type

The interpolation type for the new keys.

Bake Modifiers

If enabled, the new keyframes are based on the modified curve, and the modifiers get deleted.

If disabled, the new keyframes are based on the original curve, and the modifiers stay applied.

Discontinuity (Euler) Filter

Reference

Menu:: *Channel ‣ Discontinuity (Euler) Filter*

Cleans up Euler rotation channels that suffer from Gimbal Lock. The channels of all three euler rotation axes need to be selected for this to work.

Frame Selected Channels

Reference

Menu:: *Channel ‣ Frame Selected Channels*
Shortcut:: `NumpadPeriod`

Pans and zooms the view to show all keyframes of the selected curves. You can also click a channel with `Alt-MMB`.

F-Curves

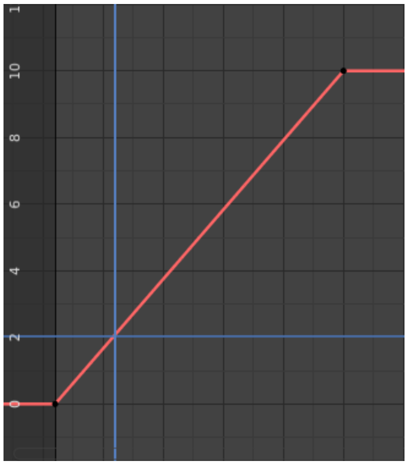
- Introduction
  - Direction of Time
- Editing
  - Transform
  - Snap
  - Mirror
  - Jump to Selected
  - Insert
  - Copy/Paste
  - Duplicate
  - Delete
  - Handle Type
  - Interpolation Mode
  - Easing Type
  - Density
  - Blend
  - Smooth
- Properties
  - Active F-Curve
  - Active Keyframe
- F-Curve Modifiers
  - Interface
  - Adding a Modifier
  - Types of Modifiers

Introduction

Blender lets you animate almost any property, going from the X coordinate of an object to the transparency of a material. The evolution of a property's value over time is described by a *function curve*, or F-Curve for short.

An important aspect of F-Curves is that they can interpolate. This saves you the effort of manually configuring a value on every single frame, which would be highly impractical. Instead, you define just a few values on key frames, and let the curve calculate the values on all the other frames.

The example curve on the right has two such keyframes (indicated by black dots): one on frame 0 with value 0, and another on frame 25 with value 10. The curve automatically calculates the values for the other frames, such as for frame 5 where the value is 2.



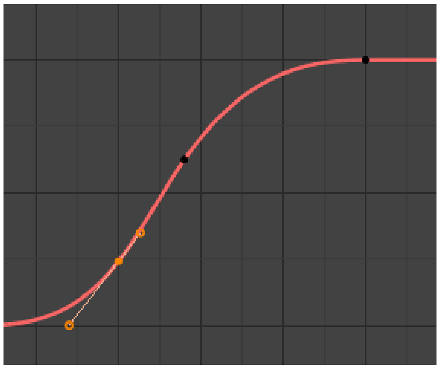
Example of interpolation.

Direction of Time

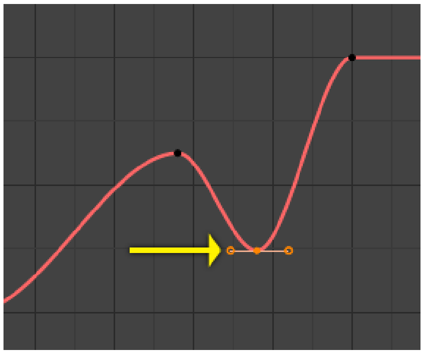
F-Curves are similar to Curve objects in that they interpolate between a set of user-defined control points. However, because their purpose is to define a *single* value on every frame, there's an important difference: F-curves can't be closed or otherwise made to turn back on themselves. They always continue going further to the right.

If you try to make a curve go left by dragging one control point past another, it switches the order of the points to prevent this.

Two control points switching: the curve cannot go back in time!



Before moving the second keyframe.



After moving the second keyframe.

Editing

Transform

Reference

Mode:: Edit Mode
Menu:: *Key ‣ Transform*

An F-Curve can be edited by transforming the locations of its keyframes.

Move, Rotate, Scale

Like other elements in Blender, keyframes can be moved, rotated, and scaled as described in Basic Transformations.

Extend `E`

Lets you quickly move the selected keyframes that are on a certain side of the Playhead. This is handy if you need to, say, move all the keyframes after a certain time point to the right to make space for new ones.

To use this operator, first select some or all keyframes and place your mouse cursor to the left or right of the Playhead. Then, press `E`, move the mouse to move (only) the keyframes on that side of the Playhead, and press `LMB` to confirm (or `RMB` to cancel).

Tip

You can also change the *Key Frame* and *Value* properties in *Sidebar ‣ F-Curve ‣ Active Keyframe* if you want to specify exact numbers.

While transforming keyframes, you can hold `Shift` to move them more slowly for better precision, or `Ctrl` to move them in coarse increments.

Snap

Reference

Menu:: *Key* ▸ *Snap*
Shortcut:: `Shift-S`

Apart from using the snapping operators in this menu, you can also turn on snapping in the header.

Selection to Current Frame
: Set the selected keyframes' time to the current frame.

Selection to Cursor Value
: Set the selected keyframes' value to that of the 2D Cursor.

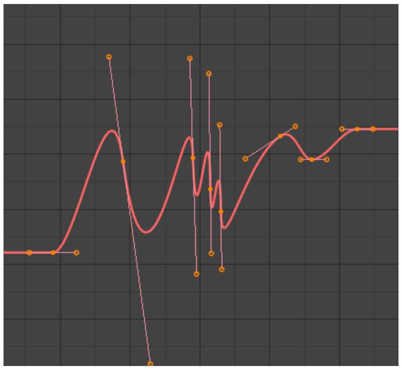
Selection to Nearest Frame
: Round the time of each keyframe to the nearest frame.

Selection to Nearest Second
: Round the time of each keyframe to the nearest second. You can use *View* ▸ *Show Seconds* to show seconds instead of frames at the top of the editor.

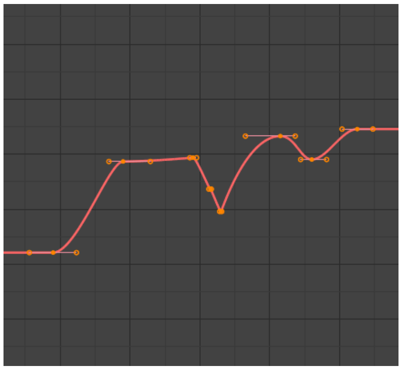
Selection to Nearest Marker
: Set the time of each keyframe to that of the nearest marker.

Flatten Handles
: Flatten the *Bézier* handles for the selected keyframes.

Flatten Handles snapping example.



Before Flatten Handles.



After Flatten Handles.

Equalize Handles

Ensure selected keyframes' handles have equal length.

Side

Which handles to affect (left, right, or both).

Handle Length

Length to make selected keyframes' Bézier handles.

Flatten

Make the values of the handles the same as their respective keyframes.

Cursor to Selected `Ctrl-G`

Changes the time and value of the 2D Cursor to the average time and value of the selected keyframes.

Cursor Value to Selection

Changes the value of the 2D Cursor to the average value of the selected keyframes.

Mirror

Reference

Menu::	*Key ‣ Mirror*
Shortcut::	`Ctrl-M`

Mirrors the selected keyframes across a reference point.

By Times over Current Frame
    Mirror horizontally across the current frame.

By Values over Cursor Value
    Mirror vertically across the 2D Cursor’s value.

By Times over Zero Time
    Mirror horizontally across frame 0.

By Values over Zero Value
    Mirror vertically across value 0.

By Times over First Selected Marker
    Mirror horizontally across the first selected marker.

Jump to Selected

Reference

Menu::	*Key ‣ Jump to Selected*
Shortcut::	`Ctrl-G`

Places the 2D Cursor at the average time and value of the selected keyframes.

Insert

Reference

Menu::	*Key ‣ Insert*
Shortcut::	`I`

Adds new keyframes and selects them. Previously selected keyframes stay selected too.

All Channels
  Insert a keyframe on all visible and editable F-Curves using each curve's current value.

Only Selected Channels
  Insert a keyframe on the selected F-Curves using each curve's current value.

Only Active F-Curve
  Insert a keyframe on the active F-Curve using the curve's current value.

Active Channels at Cursor
  Insert a keyframe on the active F-Curve at the 2D Cursor's value.

Selected Channels at Cursor
  Insert a keyframe on the selected F-Curves at the 2D Cursor's value.

Copy/Paste

Reference

Menu::	*Key* ‣ *Copy*, *Key* ‣ *Paste*
Shortcut::	`Ctrl-C`, `Ctrl-V`

Use `Ctrl-C` to copy the selected keyframes and `Ctrl-V` to paste them. After pasting, the Adjust Last Operation panel provides some extra options:

Frame Offset
  Offsets the pasted keyframes horizontally so that…

  Frame Start
    …the first one lands on the current frame.

  Frame End

…the last one lands on the current frame.

Frame Relative
…they land at the same distance from the current frame as when they were copied.

No Offset
…they stay at their original frames.

Value Offset
Offsets the pasted keyframes vertically so that…

Left Key
…the first one has the value of the existing keyframe to the left of the Playhead.

Right Key
…the last one has the value of the existing keyframe to the right of the Playhead.

Current Frame Value
…the first one has the value of the curve at the current frame.

Cursor Value
…the first one has the value of the 2D Cursor.

No Offset
…they keep their original values.

Type
Mix
Integrates the pasted keyframes with existing ones, only overwriting those that share a frame.

Overwrite All
Removes all previous keyframes in the target F-Curves.

Overwrite Range

Within each F-Curve, remove the existing keyframes that are in the range of the keyframes pasted into it.

Overwrite Entire Range

Within each F-Curve, remove the existing keyframes that are in the range of all pasted keyframes combined.

Flipped

If you copied keyframes from one or more pairs of symmetrically opposite bones, enabling this option will paste the keyframes of the left bones into the curves of the right ones and vice versa. In addition, the values are inverted, effectively mirroring the animation.

Duplicate

Reference

Menu::	*Key ‣ Duplicate*
Shortcut::	`Shift-D`

Duplicates the selected keyframes. You can reposition them by moving the mouse.

Delete

Reference

Menu::	*Key ‣ Delete*
Shortcut::	`X`, `Delete`

Pressing `X` or `Delete` opens a pop-up menu from where you can delete the selected keyframes.

Handle Type

Reference

Menu:: *Key ‣ Handle Type*
Shortcut:: `V`

Sets the handle type of the selected keyframes.

Interpolation Mode

Reference

Menu:: *Key ‣ Interpolation Mode*
Shortcut:: `T`

Sets the interpolation mode of the selected keyframes. This determines the curve interpolation between each keyframe and the next.

Easing Type

Reference

Menu:: *Key ‣ Easing Type*
Shortcut:: `Ctrl-E`

Sets the easing mode of the selected keyframes. This determines whether easing is applied to the left side, right side, or both sides of the curve segments between each keyframe and the next.

Density

Decimate

Reference

Menu::	*Key ‣ Density ‣ Decimate (Ratio)*
Menu::	*Key ‣ Density ‣ Decimate (Allowed Change)*

Simplifies an F-Curve by removing the keyframes that influence its shape the least.

Mode

How to pick the number of keyframes to delete.

Ratio

Deletes a certain percentage of keyframes.

Remove

The percentage of keyframes to remove.

Error Margin

Deletes as many keyframes as possible while ensuring the F-Curve's shape changes no more than a certain amount.

Max Error Margin

How much the decimated curve may deviate from the original.

Bake Keyframes

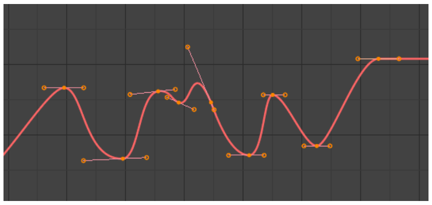
Reference

Menu::	*Key ‣ Density ‣ Bake Keyframes*
Shortcut::	`Shift-Alt-O`

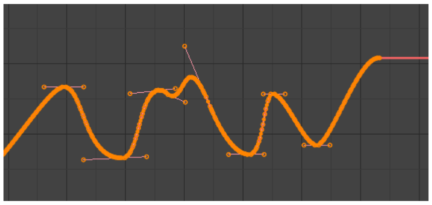
Creates a keyframe at every frame.

See also

Bake Channels, which offers options on what range to bake and how.



F-Curve before baking.



F-Curve after baking.

Clean Keyframes

Reference

Menu:: *Key ‣ Density ‣ Clean Keyframes*
Shortcut:: X

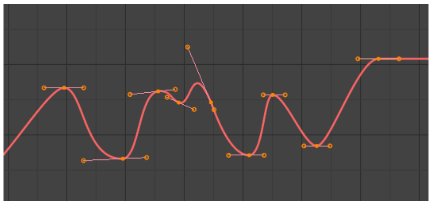
Finds redundant keyframes among the selected ones and deletes them. A keyframe is seen as redundant if it has the same value as its neighbors – even if the curve segments around it aren't flat.

Tip

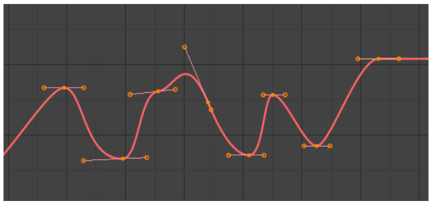
This operator is likely to change the shape of the affected curves, so it's best run after e.g. bulk keyframe insertion on all the bones of an armature (which creates useless keyframes on bones that haven't moved) and before tweaking the curves by hand.

Threshold
: Value threshold. By increasing this, you can also delete keyframes that *almost* have the same value as their neighbors.

Channels
: Cleans all the keyframes (even unselected ones) in the selected F-Curves. If a curve is left with only one keyframe, it's deleted entirely.



F-Curve before cleaning.



F-Curve after cleaning.

Blend

Reference

Menu:: *Key ‣ Blend*

Shortcut:: `Alt-D`

Adjusts the values of the selected keyframes by a certain percentage. Select a blending operator, move the mouse left or right to adjust the factor, and click `LMB` to confirm (or `RMB` to cancel).

Several blending operators work based on “neighboring keyframes.” This means that they divide the selected keyframes into contiguous groups, then reference the unselected keyframes immediately before and after each group.

Breakdown

Reference

Menu:: *Key ‣ Blend ‣ Breakdown*

Sets the value of the selected keyframes to an interpolation of their neighbors.

Factor

At -1, the keyframes are set to the value of the left neighbor.

At 1, they're set to the value of the right neighbor.

For other factors, they're set to an interpolation between the two neighbor values, with 0 being right in the middle.

Blend to Neighbor

Reference

Menu:: *Key ‣ Blend ‣ Blend to Neighbor*

Moves each selected keyframe towards the value of the left or right neighbor by a certain percentage.

Blend

When negative, each keyframe moves *Blend* percent to the value of the left neighbor.

When positive, they move to the right neighbor.

When zero, they keep their original values.

Blend to Default Value

Reference

Menu:: *Key ‣ Blend ‣ Blend to Default Value*

Moves the selected keyframes towards the property's default value by a certain percentage.

Factor

How much to change the keyframes' values, going from 0 (no change) to 1 (reset to the default value).

See also

The Reset to Default operator resets any property to its default value without the need of keyframing.

Ease

Reference

Menu:: *Key ▸ Blend ▸ Ease*

Makes the selected keyframes follow an S-curve. While the slider is visible (so after activating the operator but before confirming with `LMB`), you can press `Tab` to toggle which of the following settings to edit:

Curve Bend
: A negative value gives more weight to the left side, while a positive value gives more weight to the right. A value of 0 results in a balanced curve.

Sharpness
: A low value results in an almost straight diagonal line, while a high value results in a steep rise/drop in the curve.

Blend Offset

Reference

Menu:: *Key ▸ Blend ▸ Blend Offset*

Moves the selected keyframes up or down – all by the same amount – until the first/last one matches the left/right neighbor.

Offset Factor
: At -1, the first selected key gets aligned to its left neighbor.

At 1, the last selected key gets aligned to its right neighbor.

At 0, nothing changes.

Blend to Ease

Reference

Menu:: *Key ‣ Blend ‣ Blend to Ease*

Blends the selected keys to either an “ease in” or an “ease out” curve.

Blend

At -1, the keys will follow an “ease in” curve, with small value changes in the beginning and large changes towards the end.

At 1, the keys will follow an “ease out” curve, with large value changes in the beginning and small changes towards the end.

At 0, nothing changes.

Match Slope

Reference

Menu:: *Key ‣ Blend ‣ Match Slope*

Blends the selected keys towards a straight line going through two keys just outside the current selection.

Factor

Negative values use the two keys to the left of the selection.

Positive values use the keys to the right.

At zero, nothing changes.

Push Pull

Reference

Menu:: *Key ‣ Blend ‣ Push Pull*

Moves the selected keys towards, or away from, the straight line going through the first and last selected key.

Factor

At 0, the keys will lie on the straight line.

At 1, they keep their original values.

At 2, each key's value will be twice as far from the straight line as before.

Shear Keys

Reference

Menu:: *Key ‣ Blend ‣ Shear Keys*

Shears the selected keyframes – that is, changes their value by an amount that increases as they get further away in time from a reference keyframe. By default, this reference keyframe is the leftmost selected one, but you can instead use the rightmost one by pressing `D`.

Shear Factor

How much to shear. Negative values move keyframes downwards, while positive ones move them up.

Direction

Whether to use the leftmost or the rightmost selected keyframe as a reference.

Scale Average

Reference

Menu:: *Key ‣ Blend ‣ Scale Average*

Scales the selected keyframes vertically, using their average value as the pivot.

Factor

At 0, the keyframes will all have the average value.

At 1, they keep their original values.

At 2, each keyframe's value will be twice as far from the average as before.

Scale from Neighbor

Reference

Menu:: *Key ‣ Blend ‣ Scale from Neighbor*

Scales the selected keyframes vertically, using a keyframe just outside the selection as the pivot. By default, this is the neighbor to the left of the selection, but you can instead use the right one by pressing `D`.

Factor

The scale factor to apply.

Reference Key

Whether to use the left or right neighbor as the pivot.

Time Offset

Reference

Menu:: *Key ‣ Blend ‣ Time Offset*

Shifts the values of the selected keyframes so that the resulting F-Curve appears to move in time. Works best with dense keyframes.

As the curve leaves the selected keyframes' time range on one end, it wraps back in on the other, offset vertically so that the ends connect and there is no jump.

Frame Offset

By how many frames to shift the F-Curve. The slider is limited to the range -10 … 10, but you can type larger numbers too.

Smooth

Reference

Menu::	*Key ‣ Smooth*
Shortcut::	`Alt-S`

Smooth (Gaussian)

Reference

Menu::	*Key ‣ Smooth ‣ Smooth (Gaussian)*

Smooths the selected keyframes using a Gaussian kernel. Click the menu item, move the mouse left or right to adjust the strength, and click `LMB` to confirm (or `RMB` to cancel).

Factor

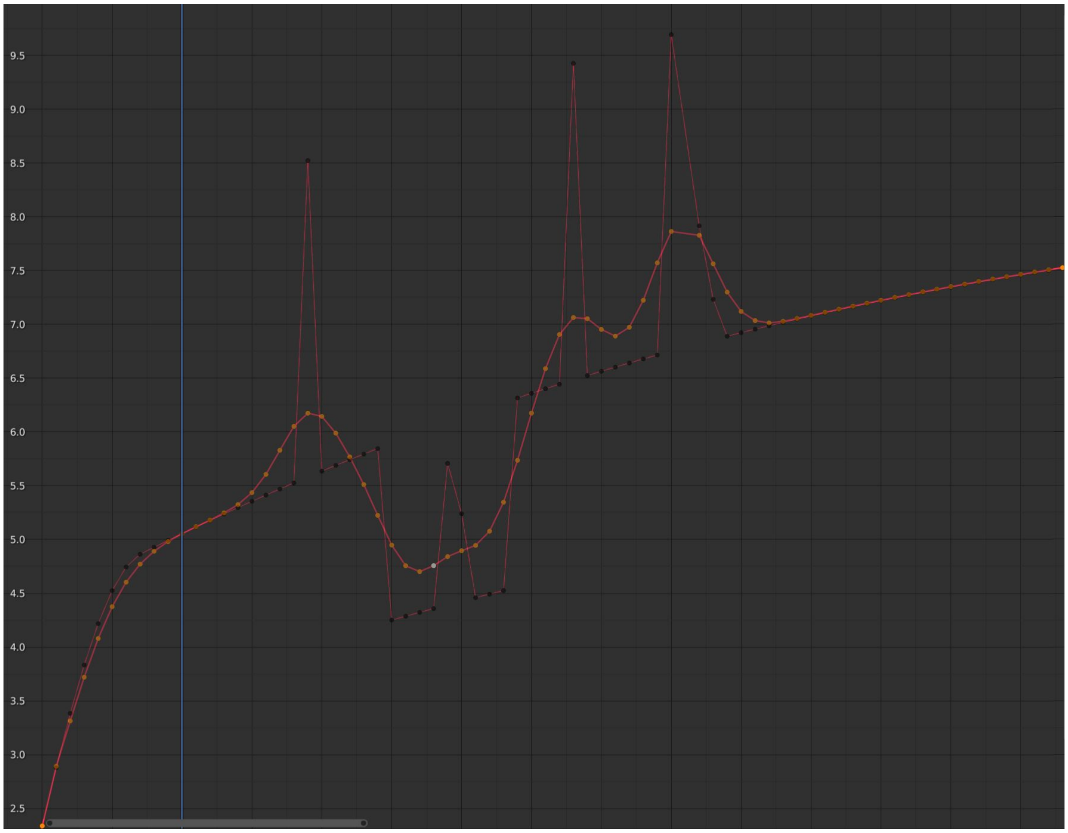
How strongly the smoothing should be applied.

Sigma

The shape of the gaussian distribution. Lower values mean a sharper curve, giving keys that are close to each other more weight. A high value behaves like a simple average filter.

Filter Width

A wider filter looks at more keyframes, producing a smoother result. At a width of 1, the filter only looks at the keyframes to the immediate left and right for a weighted average.



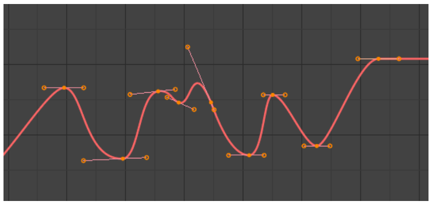
F-Curve after applying the Gaussian Smooth with the original curve overlayed.

Smooth (Legacy)

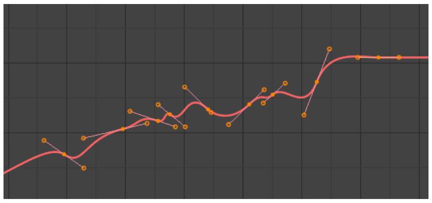
Reference

Menu:: *Key ‣ Smooth ‣ Smooth (Legacy)*
Shortcut:: `Alt-O`

There is also an option to smooth the selected curves, but beware: its algorithm seems to be to halve the distance between each keyframe and the average linear value of the curve, which gives quite a strong smoothing! Note that the first and last keys seem to be never modified by this tool.



F-Curve before smoothing.



F-Curve after smoothing.

Butterworth Smooth

Reference

Menu:: *Key ‣ Smooth ‣ Butterworth Smooth*

Smooth the selected keyframes using a Butterworth filter. Click the menu item, move the mouse left or right to adjust the frequency, and click `LMB` to confirm (or `RMB` to cancel).

This filter is ideal for smoothing large amounts of data because it preserves the peaks of the animation. The downside is that it can introduce a ripple effect when the key values change rapidly.

Frequency Cutoff

The lower the value, the smoother the curve. There is an implicit maximum at which the value no longer changes the curve, which is at half the sample rate. The sample rate in this case is the scene frame rate multiplied by the **Samples per Frame** of this operator.

Filter order

Higher values mean the frequency cutoff is steeper.

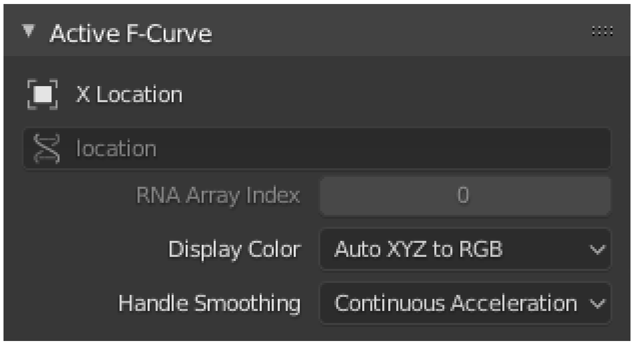
Samples per Frame

Properties

Active F-Curve

Reference

Panel:: *Sidebar region ‣ F-Curve ‣ Active F-Curve*



X Location

location

RNA Array Index: 0

Display Color: Auto XYZ to RGB

Handle Smoothing: Continuous Acceleration

Active F-Curve panel.

This panel displays properties for the active F-Curve.

Channel Name
The name of the property that’s animated by the curve.

Data Path
The programmatic path to the property.

RNA Array Index
The index into the property, for multi-value properties. As an example, the Location property has three values (X, Y and Z), which means it can have three different curves with indices 0, 1 and 2.

Display Color
How to determine the color of the F-Curve in the Graph editor.

Auto Rainbow

Assigns a unique color to each curve that uses this setting.

Auto XYZ to RGB

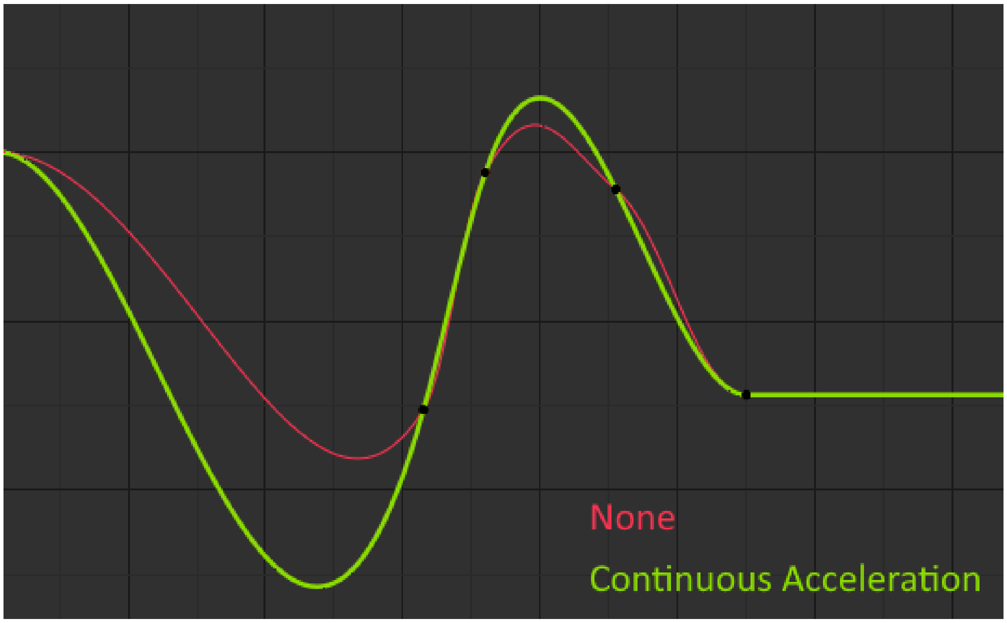
Detects curves that animate an X/Y/Z coordinate and colors them red/green/blue accordingly.

User Defined

Lets you choose the color yourself.

Handle Smoothing

How to compute the [Bézier handles]() when using the *Automatic* or *Auto Clamped* handle type.



Handle smoothing mode comparison.

None

Only directly adjacent key values are considered when computing the handles.

This older method is very simple and predictable, but it can only produce truly smooth curves in the most trivial cases. Notice that the red curve in the image above has a few kinks in the middle.

Continuous Acceleration

A system of equations is solved in order to avoid or minimize jumps in acceleration at every keyframe.

It produces much smoother curves out of the box, but necessarily means that any changes in the key values may affect interpolation over a significant stretch of the curve; although the amount of change decays exponentially with distance. This change propagation is stopped by any key with *Free*, *Aligned*, or *Vector* handles, as well as by extremes with *Auto Clamped* handles.

The mode also tends to overshoot and oscillate more with fully *Automatic* handles in some cases (see the image above). So it is recommended to use *Auto Clamped* by default, and only switch to *Automatic* handles in places where this is desired behavior. That effect can also be reduced by adding in-between keys.

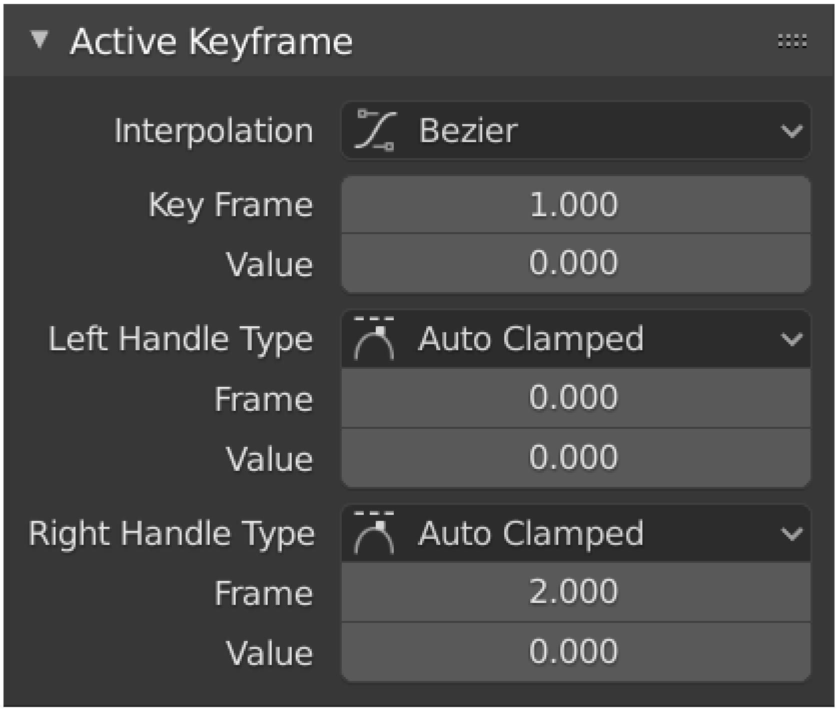
Tip

Considering the upsides and downsides of each mode, *Continuous Acceleration* should be better suited for limited animation, which uses a small number of interpolated keys with minimal manual polish. In case of highly polished high key rate animation, the benefits of smoothing may not outweigh the workflow disruption from more extensive change propagation.

Active Keyframe

Reference

Panel::	*Sidebar region ‣ F-Curve ‣ Active Keyframe*



Active Keyframe

Interpolation: Bezier

Key Frame: 1.000

Value: 0.000

Left Handle Type: Auto Clamped

Frame: 0.000

Value: 0.000

Right Handle Type: Auto Clamped

Frame: 2.000

Value: 0.000

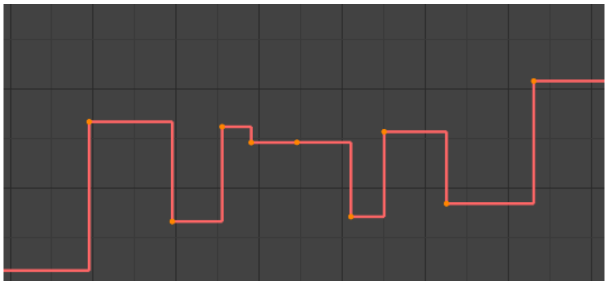
Active Keyframe panel.

Interpolation

The interpolation to use between the active keyframe and the next.

Interpolation

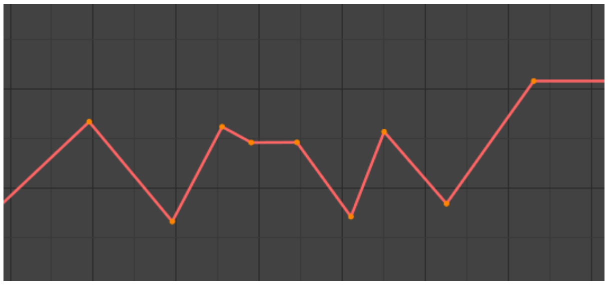
Constant::



Constant.

The curve holds the value until the next keyframe, producing a stair step effect with very abrupt changes. Normally only used during the initial "blocking" stage in pose-to-pose animation workflows.

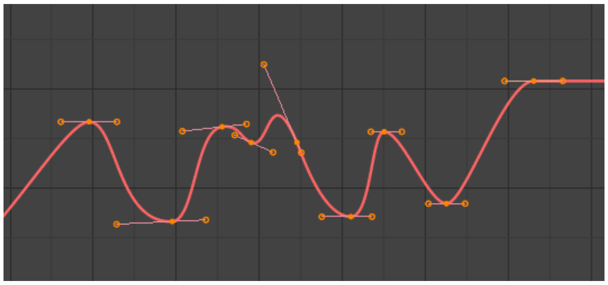
Linear::



Linear.

The curve goes from one keyframe to the next in a straight line, which prevents abrupt changes in value but not in speed. By creating two keyframes with Linear interpolation and extrapolation, you can easily make a straight line curve that goes on forever.

Bézier::



Bézier.

The default interpolation, which is smooth in both values and speed.

Note

F-Curves for properties that only accept discrete values will always have a stair step pattern, no matter which option you chose.

Easing (by strength)

A set of interpolations that specialize in accelerating or decelerating an value, “easing” it from a stationary into a moving state or vice versa.

See also

For more info and a few live demos, see easings.net and Robert Penner's Easing Functions.

Dynamic Effects

These additional easing types imitate (fake) physics-based effects like bouncing.

Back

With *Ease In*, the value first moves away from the target and then shoots towards it. With *Ease Out*, it goes towards the target, overshoots it, and then returns.

Back

The size and direction (i.e. above/below the curve) of the overshoot.

Bounce

Makes the value bounce a few times with exponential decay, like a tennis ball that was dropped on the floor.

Elastic

Makes the value overshoot the target, then rebound and undershoot it, then overshoot it again… with ever-decreasing intensity until it eventually settles.

Amplitude

How far the value initially overshoots its target.

Period

How much time there is between each oscillation.

Easing

This option only applies to the *Easing* and *Dynamic Effects* categories above.

Automatic Easing

Automatically pick the most commonly used type: *Ease In* when using one of the *Easing* interpolations, and *Ease Out* when using one of the *Dynamic Effects*.

Ease In

The value accelerates, moving slowly at the beginning of the curve segment and speeding up towards the end.

Ease Out

The value decelerates, moving quickly at the beginning of the curve segment and slowing down towards the end.

Ease In Out

The value moves slowly in the beginning, speeds up towards the middle, and slows down again towards the end.

Key Frame

The frame of the active keyframe.

Value

The value of the active keyframe.

Left/Right Handle Type

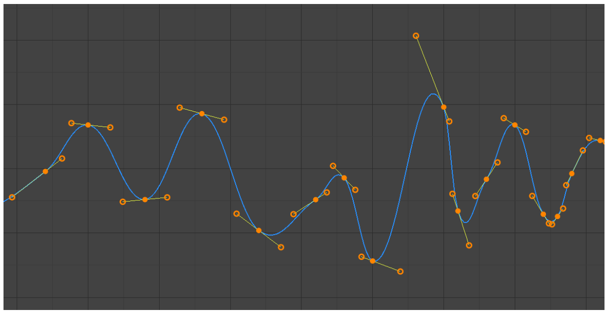
When the keyframe's interpolation is set to *Bézier*, the shape of the curve around it is influenced by its handles. Each handle has its own type which determines if (and how) Blender positions it automatically, and if not, how much freedom you have in positioning it manually.

You can change the handles' types in multiple ways: using these dropdowns in the Sidebar; through the menu *Key ‣ Handle Type*; or by pressing V and selecting from the popup menu.

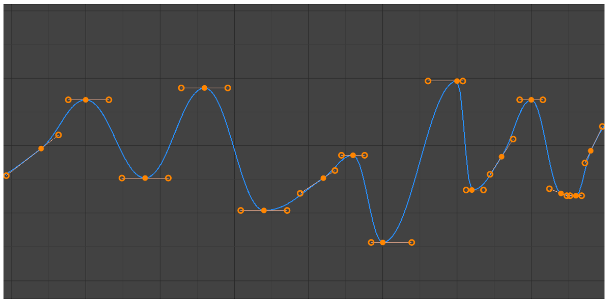
If you want to change an automatic handle's position, just drag it; you don't need to manually change its type first.

Automatic:: Automatic handles that produce smooth curves.

Auto Clamped::



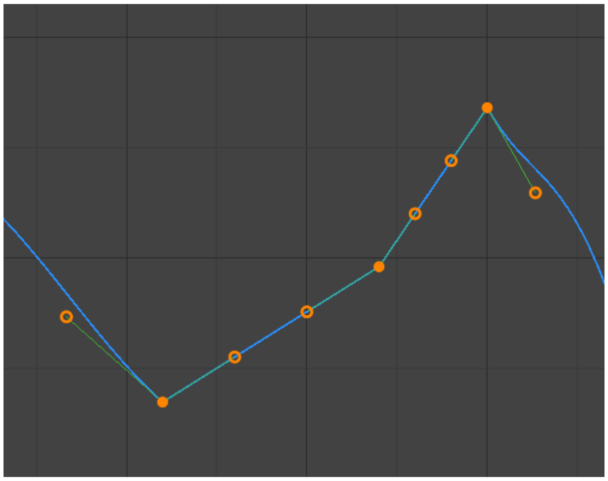
Auto handles.



Auto clamped handles.

Automatic handles clamped to prevent overshoots and changes in the curve direction between keyframes (S-shapes).

Vector::

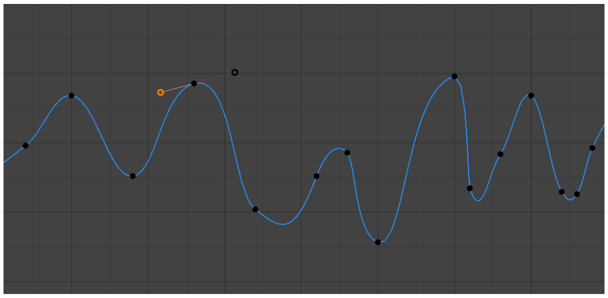


Vector handles.

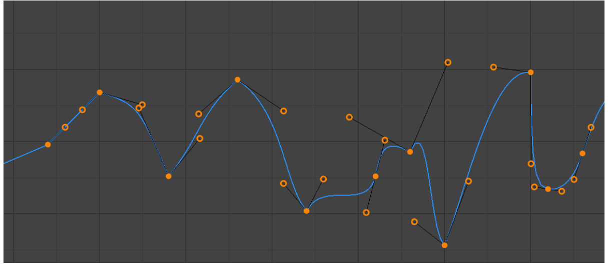
Automatic handles that produce straight curve segments (like linear interpolation).

Aligned:: Manual handles, which are however locked together to always point in opposite directions. This results in a curve that is always smooth at the control point.

Free::



Aligned handles.



Free handles.

Manual handles that can be moved independently, and thus can result in a sharp change of direction.

Frame, Value

The frame and value for the left/right handle of the active keyframe.

F-Curve Modifiers

Reference

Panel::	*Sidebar region ‣ Modifiers*

F-Curve modifiers are similar to object modifiers, in that they add non-destructive effects that can be adjusted at any time and layered to create more complex effects.

Modifiers are evaluated from top to bottom. You can change their order by dragging the dots in their top right corner.

Interface

Name
: By default, modifiers are named after their function, but this can be changed.

Mute
: Click the checkbox in a modifier's header to disable it.

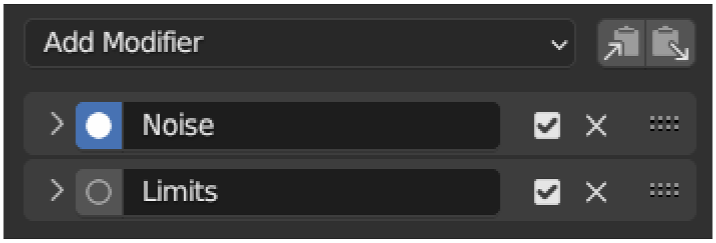
Delete
: Click the cross in a modifier's header to delete it.

Influence
: Lets you blend between the original curve and the modified one.

Restrict Frame Range
: Start/End
: The frame on which the modifier's effect starts/ends.

: Blend In/Out
: The number of frames, relative the start/end values above, it takes the modifier to fade in/out.

Adding a Modifier



Modifiers panel.

Modifiers can be managed on the *Modifiers* tab of the Sidebar. Select an F-Curve (in the channel region or by selecting one of its keyframes), then click the *Add Modifier* dropdown and choose the modifier to add.

Types of Modifiers

Generator Modifier

Creates a polynomial function. These are basic mathematical formulas that represent lines, parabolas, and other more complex curves, depending on the values used.

See also

The Wikipedia Page for more information on polynomials.

Mode

Method used to represent the equation.

Expanded Polynomial

Equation in the form $y = A + Bx^1 + Cx^2 + ... + Dx^n$.

Factorized Polynomial

Equation in the form $y = (Ax + B)(Cx + D)$.

Additive
Add the polynomial to the curve rather than replacing it.

Order
The highest power of x for this polynomial.

Coefficient
The constants A, B, C… in the equation.

Built-in Function Modifier

These are additional formulas, each with the same options to control their shape. Consult mathematics reference for more detailed information on each function:

Type
The built-in function to use:

- Sine
- Cosine
- Tangent
- Square Root
- Natural Logarithm
- Normalized Sine: \(sin(x)/x\)

Additive
Add the function to the curve rather than replacing it.

Amplitude
Adjusts the Y scaling.

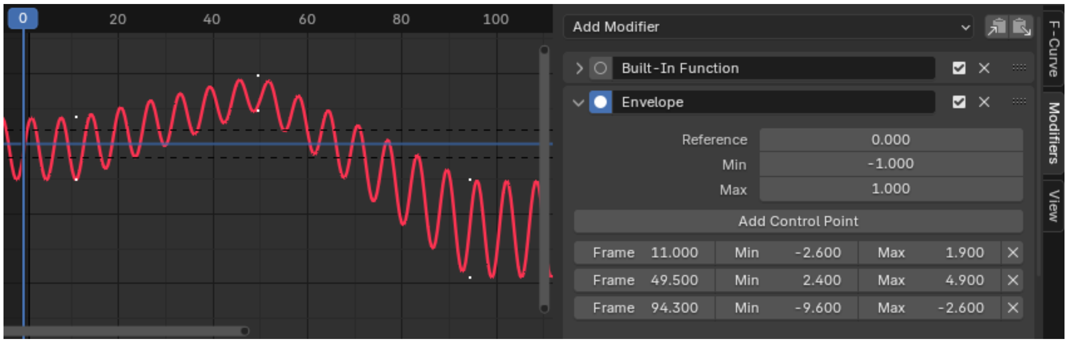
Phase Multiplier
Adjusts the X scaling.

Phase Offset
Adjusts the X offset.

Value Offset
Adjusts the Y offset.

Envelope Modifier

Lets you reshape the curve. First, you define an envelope, which consists of two horizontal lines that more or less match the curve's lower and upper bounds. Then, you add control points, where each point can push, squeeze, and stretch the envelope (and the curve along with it) at a certain frame.


0
20
40
60
80
100
Add Modifier
Built-In Function
Envelope
Add Control Point
F-Curve
Modifiers
View

Reference 0.000
Min -1.000
Max 1.000

Frame	11.000	Min	-2.600	Max	1.900
Frame	49.500	Min	2.400	Max	4.900
Frame	94.300	Min	-9.600	Max	-2.600

The Envelope modifier.

Reference
: The value which the envelope is centered around.

Min/Max
: The offset from the reference value to the envelope's initial lower/upper bound.

Add Control Point
: Adds a control point at the current frame.

Point
: Frame
: : The frame of the control point.

: Min/Max
: : The offset from the reference value to the envelope's adjusted lower/upper bound at this frame.

Cycles Modifier

Makes the curve repeat itself.

Note

The Cycles Modifier can only be the first modifier.

Before/After Mode
    No Cycles
        Do not repeat the curve before/after the original.

    Repeat Motion
        Repeats the curve, keeping the values of each copy the same.

    Repeat with Offset
        Repeats the curve, offsetting each copy vertically so that its first keyframe matches the previous last keyframe.

    Repeat Mirrored
        Repeats the curve, flipping every other copy horizontally.

Count
    The number of copies to create. A value of 0 means infinite.

Trivially Cyclic Curves

When the *Cycle Mode* for both ends is set to either *Repeat Motion* or *Repeat with Offset*, and no other options of the modifier are changed from their defaults, it defines a simple infinite cycle.

This special case receives some additional support from other areas of Blender:

- Automatic Bézier handle placement is aware of the cycle and adjusts to achieve a smooth transition.
- The Cycle-Aware Keying option can be enabled to take the cycle into account when inserting new keyframes.

Noise Modifier

Modifies the curve with a noise formula. This is useful for adding subtle or extreme randomness to animated movements, like camera shake.

Blend Type

Replace::	Adds noise in the range [-0.5, 0.5].
Add::	Adds noise in the range [0, 1].
Subtract::	Subtracts noise in the range [0, 1].
Multiply::	Multiplies by noise in the range [0, 1].

Scale

Changes the horizontal scale of the noise. Higher values make for less dense oscillation.

Strength

Changes the vertical scale of the noise.

Offset

Offsets the noise in time.

Phase

Adjusts the random seed of the noise.

Depth

Adjusts how detailed the noise function is.

Limits Modifier

Limits the curve to specific time and value ranges.

Minimum, Maximum X

Removes the original curve data to the left of the minimum frame and to the right of the maximum, replacing it by Constant extrapolation.

Minimum, Maximum Y

Clamps the curve values, never letting them go below the minimum or above the maximum.

Stepped Interpolation Modifier

Gives the curve a stepped appearance by sampling it every N frames and making it hold its value after each sample. In a sense, this lowers the curve’s frame rate by letting it change its value less frequently, producing choppy movement as a result.

Step Size
: The number of frames to hold each step.

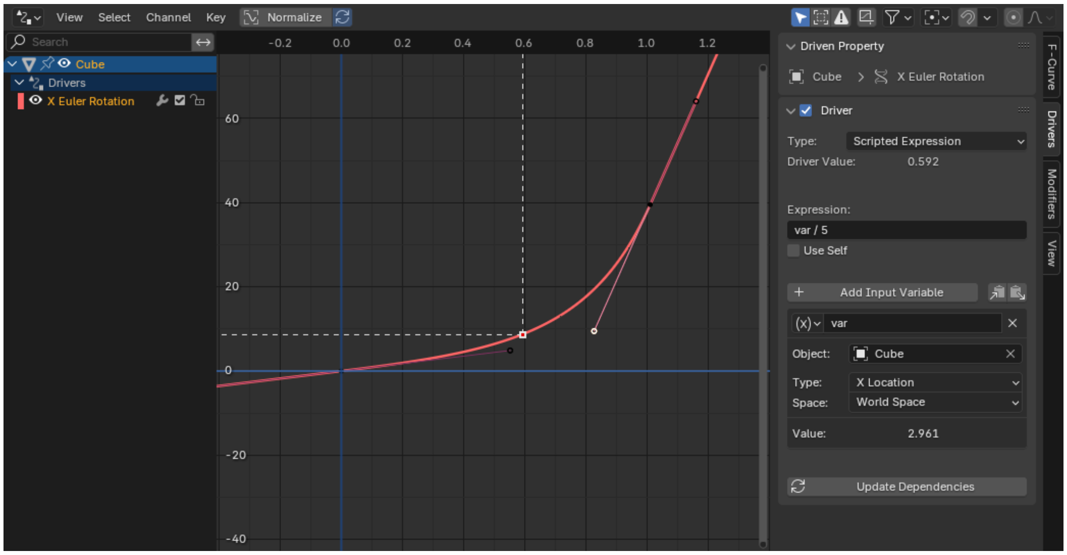
Offset
: The number of frames to offset the sample points.

Start Frame
: The frame where to start applying the effect.

End Frame
: The frame where to stop applying the effect.

Drivers Editor

This editor lets you set up Drivers, which calculate the value for a property based on other properties. In other words, they make a set of source properties “drive” the target property, and can thus serve as an alternative to animating the property by hand.


View
Select
Channel
Key
Normalize
Search
Cube
Drivers
X Euler Rotation
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
60
40
20
0
-20
-40
F-Curve
Drivers
Modifiers
View

Driven Property

Cube > X Euler Rotation

☑ Driver

Type: Scripted Expression

Driver Value: 0.592

Expression:

var / 5

☐ Use Self

Add Input Variable

(x) var

Object: Cube

Type: X Location

Space: World Space

Value: 2.961

Update Dependencies

The Drivers Editor, showing how you might drive a cube’s rotation based on its position.

The user interface is largely the same as that of the Graph Editor, with two important differences:

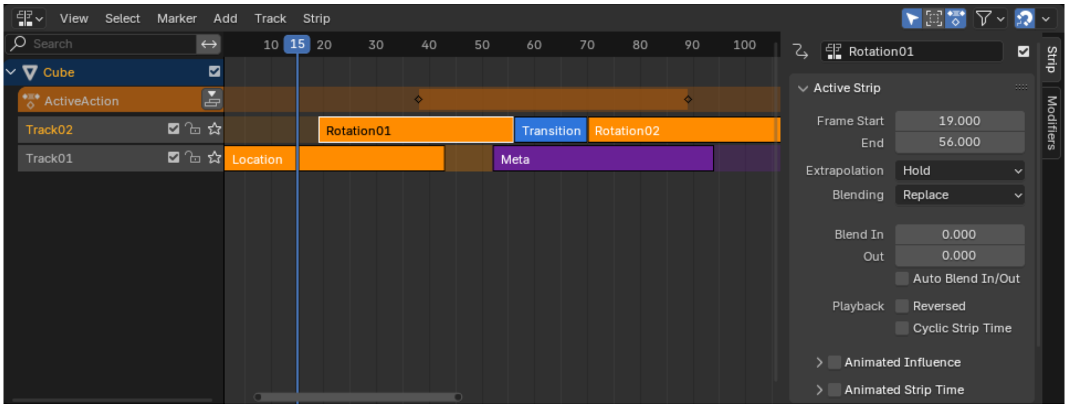
- The Sidebar has an additional Drivers tab. This is where the source properties are brought together to calculate an intermediate value for the target property.
- The curve doesn’t represent the property’s value over time, but a mapping from the above intermediate value (X axis) to the final value (Y axis).

Nonlinear Animation

- Introduction
  - Main Region
  - Header
- Tracks
  - Action Track
- Strips
  - Action Strips
  - Transition Strips
  - Sound Strips
  - Meta Strips
- Editing
  - Track
  - Strip
- Sidebar
  - Edited Action
  - Strip
  - Modifiers

Introduction

The NonLinear Animation editor, or NLA editor for short, lets you animate on a higher level. Instead of working with individual keyframes, it works with actions, which are named, reusable animation segments.


View
Select
Marker
Add
Track
Strip
Search
10
15
20
30
40
50
60
70
80
90
100
Cube
ActiveAction
Track02
Track01
Rotation01
Transition
Rotation02
Location
Meta
Strip
Modifiers
Active Strip
Animated Influence
Animated Strip Time

Rotation01

Frame Start 19.000
End 56.000
Extrapolation Hold
Blending Replace
Blend In 0.000
Out 0.000
☐ Auto Blend In/Out
Playback ☐ Reversed
☐ Cyclic Strip Time

The NLA editor.

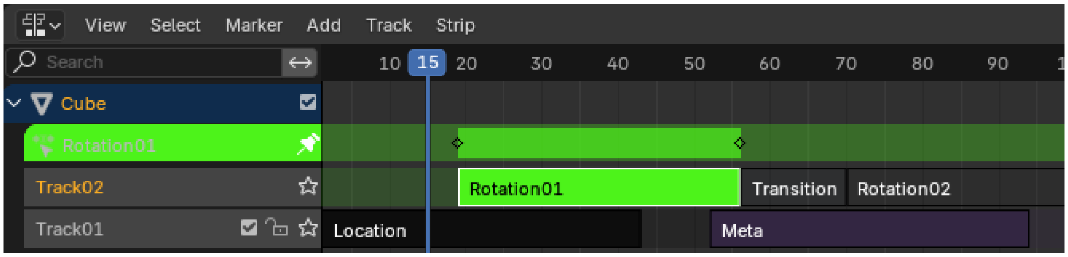
Main Region

The editor displays a stack of tracks which work like layers in an image editing program. Higher tracks take precedence over lower ones, although you can also choose to blend them.

Each track can contain any number of strips – typically Action Strips, which are instances of actions.

The top track hilighted in orange is special: this is the Action Track. Unlike the other tracks, it doesn’t contain strips – instead, it contains the object’s *active action*, which is where new keyframes are added to by default.

Editors like the Timeline and the Dope Sheet Editor normally only show the keyframes of this active action. If you want to edit another action, you can select it in the NLA editor and press `Tab` to enter Tweak Mode.


View
Select
Marker
Add
Track
Strip
Search
10
15
20
30
40
50
60
70
80
90
Cube
Rotation01
Track02
Track01
Rotation01
Transition
Rotation02
Location
Meta

Tweaking an action. Notice that it’s shown in both its original track and the Action Track. The active action is temporarily hidden.

Header

View Menu

Sidebar `N`
: Shows or hides the Sidebar Region.

Adjust Last Operation
: Displays a pop-up panel to alter properties of the last completed operation. See Adjust Last Operation.

Channels
: Shows or hides the Track Region.

Frame Selected `NumpadPeriod`
: Pans and zooms the view to focus on the selected strips.

Frame All `Home`
: Pans and zooms the view to show all strips.

Frame Scene/Preview Range
: Reset the horizontal view to the current scene frame range, taking the preview range into account if it is active.

Go to Current Frame `Numpad0`
: Centers the view on the Playhead.

Realtime Updates

Whether to update other views (such as the 3D Viewport) while you're moving strips around. If disabled, the other views only get updated once you finish the move.

Show Control F-Curves

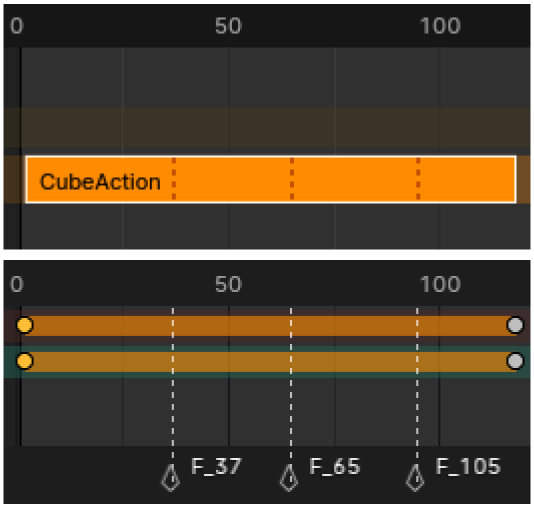
Shows a graph on top of each strip that uses Animated Influence.

Show Markers

Shows the marker region (provided any markers have been defined). When disabled, the Marker Menu is also hidden and marker operators are not available in this editor.

Show Local Markers

Shows action-local markers (which you can create in the Action Editor). This can be useful to align strips to each other.



Local markers shown in the NLA Editor (top) and the Action Editor (bottom).

Show Seconds `Ctrl-T`

Shows timing in seconds instead of frames.

Sync Visible Range

Synchronizes the horizontal panning and scale of the editor with other time-based editors that also have this option enabled. That way, they always show the same section of time.

Set Preview Range `P`

Lets you drag a box to define a time range for previewing. As long as this range is active, playback will be limited to it, letting you repeatedly view a segment of the animation without having to manually rewind each time.

You can change the start or end frame using the corresponding button in the Timeline editor's Playback popover. Alternatively, you can simply run *Set Preview Range* again.

Clear Preview Range `Alt-P`

Clears the preview range.

Set Preview Range to Selected `Ctrl-Alt-P`

Applies a preview range that encompasses the selected strips.

Area

Area controls. See the user interface documentation for more information.

Select Menu

All `A`

Selects all strips.

None `Alt-A`

Deselects all strips.

Invert `Ctrl-I`

Inverts the current selection.

Box Select `B`
: Lets you drag a box and selects the strips that are partially or completely inside it.

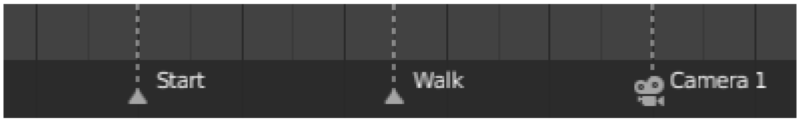
Box Select (Axis Range) `Alt-B`
: Lets you drag a box and selects the strips that overlap the corresponding time range, even if they're above or below the box.

Before Current Frame `[`
: Selects all the strips that start before (or on) the current frame.

After Current Frame `]`
: Selects all the strips that end after (or on) the current frame.

Marker Menu

Markers are used to denote frames with key points or significant events within an animation. Like with most animation editors, they're shown at the bottom.



Markers in animation editor.

For descriptions of the different marker tools, see Editing Markers.

Add Menu

Action `Shift-A`
: Adds a strip referencing an action to the active track.

Transition `Shift-T`
: Adds a transition strip between the two selected action strips.

Sound `Shift-K`

Adds a strip that controls when the Speaker object plays its sound clip.

Selected Objects
Makes the selected objects appear in the NLA Editor without adding an action or track to them.

See Strips for details on the various strip types.

Track Menu

Contains tools for working with NLA tracks. See Editing Tracks for details.

Strip Menu

Contains tools for working with NLA strips. See Editing Strips for details.

Filters

Only Show Selected
Only shows tracks belonging to objects that are selected.

Show Hidden
Shows tracks from objects that are hidden.

Include Missing NLA
Shows the Action Track even if there is no action in it.

Search
Filters the track list by a search term.

Filtering Collection
Select a collection to only show tracks from objects in that collection.

Filter by Type
Filter tracks by target type.

Sort Data-Blocks

Sorts data-blocks alphabetically to make them easier to find.

If your playback speed suffers because of this (should only really be an issue when working with lots of objects), you can turn it off.

Snap

The toggle button enables/disables automatic strip snapping. The dropdown button shows a popover with the following options:

Snap To

Type of element to snap to.

Frame::	Snap to full frames.
Second::	Snap to seconds.
Nearest Marker::	Snap to the nearest Marker.

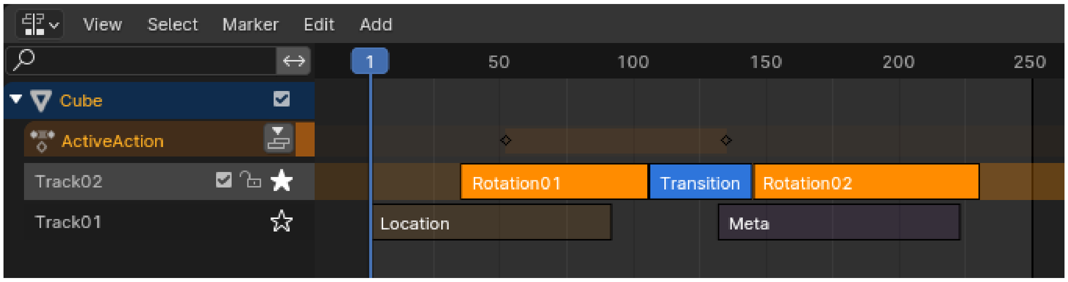
Absolute Time Snap

When disabled, strips will move in increments of *Snap To*. For example, if you selected *Second* and have a strip that currently starts on 0:06+5, dragging it to the right will snap it to 0:07+5. Its time increases by a second, and its subsecond offset of 5 frames remains the same.

When enabled, strips will snap to multiples of *Snap To*. Taking the above example, the strip would snap to 0:07+0, removing the subsecond offset.

Tracks

A track plays one or more actions in sequence. You can create multiple tracks to play several actions at the same time.


View
Select
Marker
Edit
Add
1
50
100
150
200
250
Cube
ActiveAction
Track02
Track01
Rotation01
Transition
Rotation02
Location
Meta

NLA Tracks and Strips.

The track region has the following properties:

Disable NLA stack (checkbox in blue object header)
: When unchecked, mutes all the tracks except the Action Track.

Track name
: Double-click to change. (Not possible for the Action Track, as this one simply displays the name of the action.)

Mute (checkbox in gray track header)
: When unchecked, the track stops contributing to the animation. Its strips receive a dotted outline to indicate this. Note that you can also mute individual strips.

Lock (padlock icon)
: Prevents changes from being made to this track. This is useful, for example, if you want to move the strips in all the tracks except for a few.

Solo (star icon)

Mutes all other tracks, including the Action Track, so that only this track contributes to the animation. This is useful for inspecting the track without any distractions from others.

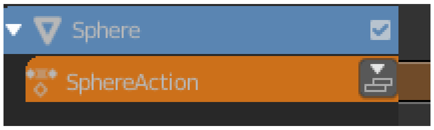
Action Track

The topmost track with the orange header holds the action that's being edited. Normally this is the object's active action, but if you select a strip and press `Tab` to enter Tweak Mode, you can temporarily make that one editable instead – in the Action Editor or the Graph Editor, for example.

The Action Track has one of the following buttons:

Push Down Action

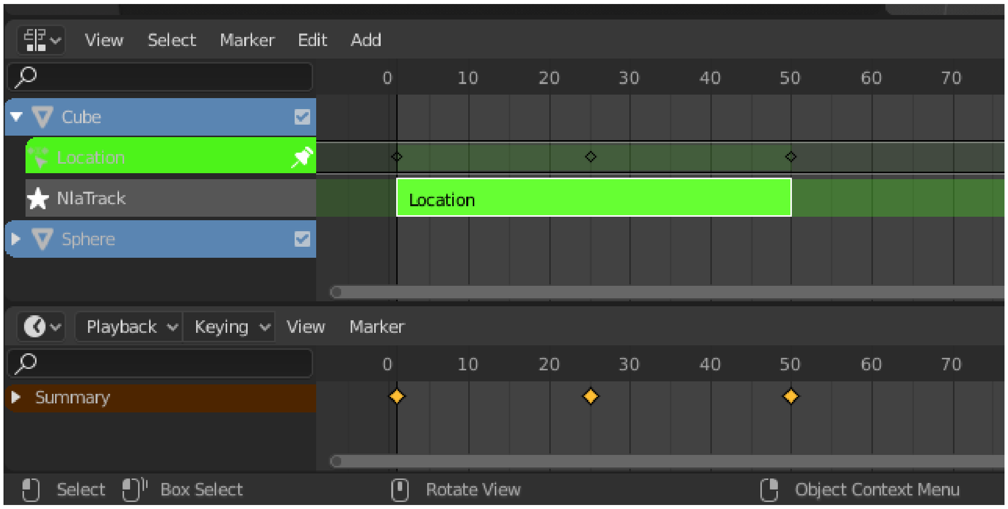
Not available in Tweak Mode. Creates a new track below the Action Track and moves the active action into it as a strip, leaving the Action Track empty. (If you create a keyframe after this, Blender will automatically create a new active action to hold it.)



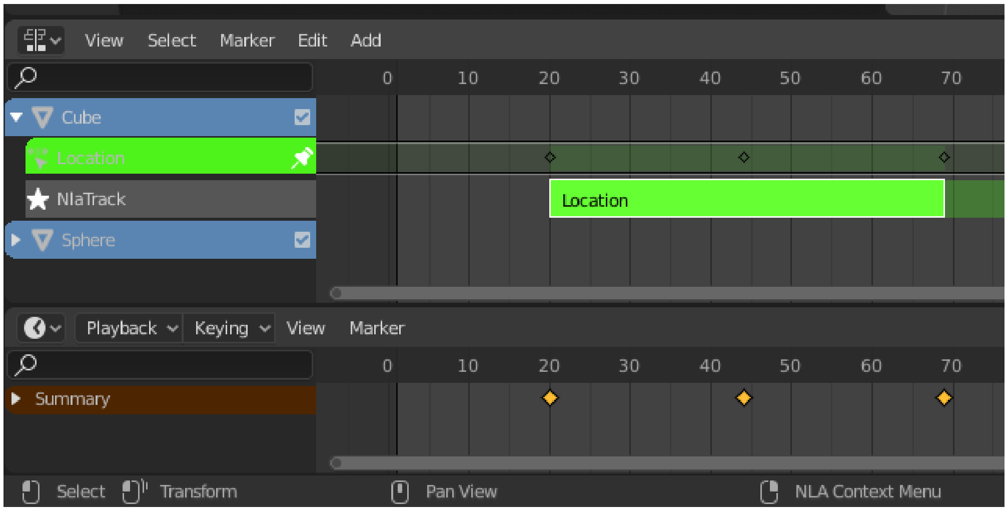
Push Down Action button.

Pin

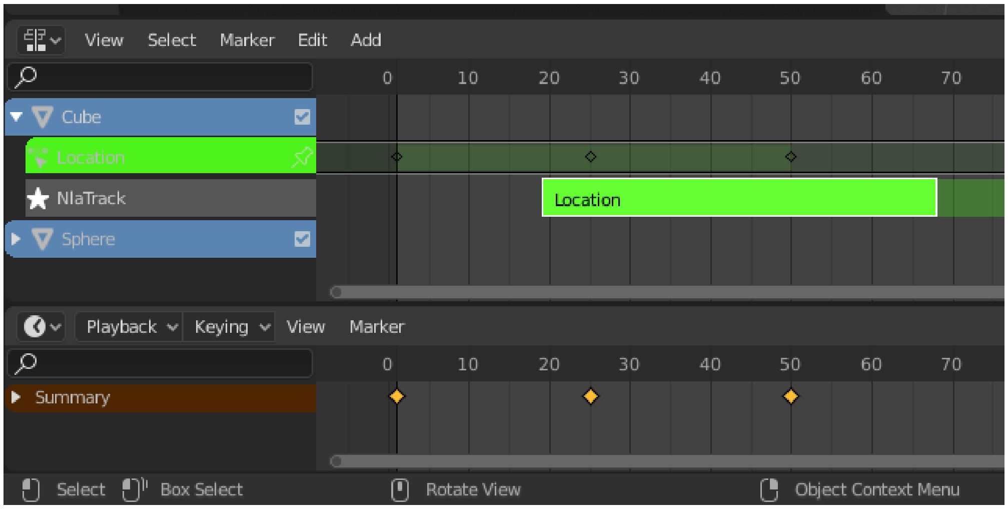
Only available in Tweak Mode. When unchecked, the action's keyframes are shown at their original time points, rather than their new time points resulting from the strip being moved and scaled.


View
Select
Marker
Edit
Add
0
10
20
30
40
50
60
70
Cube
Location
NlaTrack
Location
Sphere
Playback
Keying
View
Marker
0
10
20
30
40
50
60
70
Summary
Select
Box Select
Rotate View
Object Context Menu

Strip at its original time point.


View
Select
Marker
Edit
Add
0
10
20
30
40
50
60
70
Cube
Location
NlaTrack
Location
Sphere
Playback
Keying
View
Marker
0
10
20
30
40
50
60
70
Summary
Select
Transform
Pan View
NLA Context Menu

Strip moved. Notice that the keyframes are now shown to start at frame 20, which is also how the animation will behave. Within the action, however, they still start at frame 1.


View
Select
Marker
Edit
Add
0
10
20
30
40
50
60
70
Cube
Location
NlaTrack
Location
Sphere
Playback
Keying
View
Marker
0
10
20
30
40
50
60
70
Summary
Select
Box Select
Rotate View
Object Context Menu

After unchecking the Pin icon, the keyframes are shown at their original time points.

Strips

A strip tells the animation when something happens and for how long. There are a few different types which are described below.

Action Strips

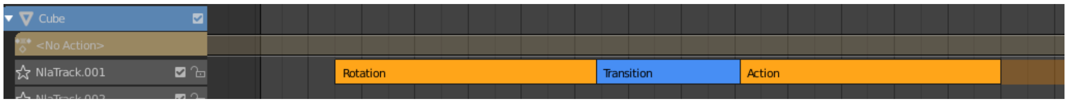
An action strip plays the keyframes inside an action. You can create one using *Add* ‣ *Action*. Another way is to click Push Down Action in the NLA's Action Track – this will create a strip based on the object's active action.

Multiple strips can reference the same action, so that you can potentially change multiple parts of the animation by editing a single set of keyframes.

A strip can be shorter than its underlying action, be it through cropping, speeding up, or both. It can also be longer than its underlying action, be it through extending, slowing down, or both. See the Sidebar for details.

Transition Strips

A transition strip interpolates between two neighboring action strips. Select them and click *Add* ‣ *Transition*.



Transition Strip.

Sound Strips

These strips control when a Speaker plays its sound clip.

Meta Strips

A meta strip groups other strips together, letting you move, scale, and copy them as one combined unit.

Editing

- Track
    - Add
    - Add Above Selected
    - Delete Tracks
    - Move
    - Remove Empty Animation Data
- Strip
    - Transform
    - Snap
    - Split
    - Duplicate
    - Linked Duplicate
    - Delete
    - Make Meta
    - Remove Meta
    - Toggle Muting
    - Bake Action
    - Apply Scale
    - Clear Scale
    - Sync Action Length
    - Make Single User
    - Start Editing Stashed Action
    - Start Tweaking Strips Actions (Full Stack)
    - Start Tweaking Strips Actions (Lower Stack)

Track

Add

Reference

Editor::	Nonlinear Animation
Menu::	*Track ‣ Delete*

Adds a new track below the Action Track.

Add Above Selected

Reference

Editor::	Nonlinear Animation
Menu::	*Track ‣ Add Above Selected*

Adds a new track above each selected one.

Delete Tracks

Reference

Editor::	Nonlinear Animation
Menu::	*Track ‣ Delete*
Shortcut::	`Delete`, `X`

Deletes the selected tracks and the strips they contain.

When using the keyboard shortcuts, make sure the mouse cursor is hovering over the track region, as otherwise, Blender will only delete the selected strips.

Move

Reference

Editor::	Nonlinear Animation
Menu::	*Track ‣ Move*

To Top `Shift-PageUp`
Moves the selected tracks to the top.

Up `PageUp`
Moves the selected tracks up by one.

Down `PageDown`
Moves the selected tracks down by one.

To Bottom `Shift-PageDown`
Moves the selected tracks to the bottom.

When using the keyboard shortcuts, make sure the mouse cursor is hovering over the track region, as otherwise, Blender will move the selected strips to different tracks (rather than moving the tracks).

Remove Empty Animation Data

Reference

Editor::	Nonlinear Animation
Menu::	*Track ‣ Remove Empty Animation Data*

Removes objects that don't have drivers, NLA tracks, or an active action from the NLA editor to reduce clutter. This essentially does the opposite of *Add ‣ Selected Objects*.

Strip

Transform

Reference

Editor:: Nonlinear Animation
Menu:: *Strip ‣ Transform*

Move `G`

Move the selected strips in time or to a different track.

Extend `E`

Lets you quickly move the selected strips that are on a certain side of the Playhead. This is handy if you need to, say, move all the strips after a certain time point to the right to make space for new ones.

To use this operator, first select some or all strips and place your mouse cursor to the left or right of the Playhead. Then, press `E`, move the mouse to move (only) the strips on that side of the Playhead, and press `LMB` to confirm (or `RMB` to cancel).

If a strip straddles the Playhead, only its starting/ending point will be moved (again depending on the position of the mouse cursor).

Scale `S`

Scales the selected strips, using the Playhead as the pivot point.

Swap

Reference

Editor:: Nonlinear Animation
Menu:: *Strip ‣ Transform ‣ Swap*

Shortcut:: `Alt-F`

Swap the order of the selected strips in their track.

Move Up

Reference

Editor:: Nonlinear Animation
Menu:: *Strip ‣ Transform ‣ Move Up*
Shortcut:: `PageUp`

Move selected strips up a track if there is room.

Move Down

Reference

Editor:: Nonlinear Animation
Menu:: *Strip ‣ Transform ‣ Move Down*
Shortcut:: `PageDown`

Move selected strips down a track if there is room.

Snap

Reference

Editor:: Nonlinear Animation
Menu:: *Strip ‣ Snap*

Selection to Current Frame
Move the start of the selected strips to the current frame.

Selection to Nearest Frame

Move the start of the selected strips to the nearest full frame.

Selection to Nearest Second
Move the start of the selected strips to the nearest second.

Selection to Nearest Marker
Move the start of the selected strips to the nearest marker.

Split

Reference

Editor::	Nonlinear Animation
Menu::	*Strip ‣ Split*
Shortcut::	`Y`

Split the selected strips in two at the current frame.

Duplicate

Reference

Editor::	Nonlinear Animation
Menu::	*Strip ‣ Duplicate*
Shortcut::	`Alt-D`

Creates copies of the selected strips, duplicating any actions they reference. Editing the keyframes in a copied strip therefore doesn't affect the original.

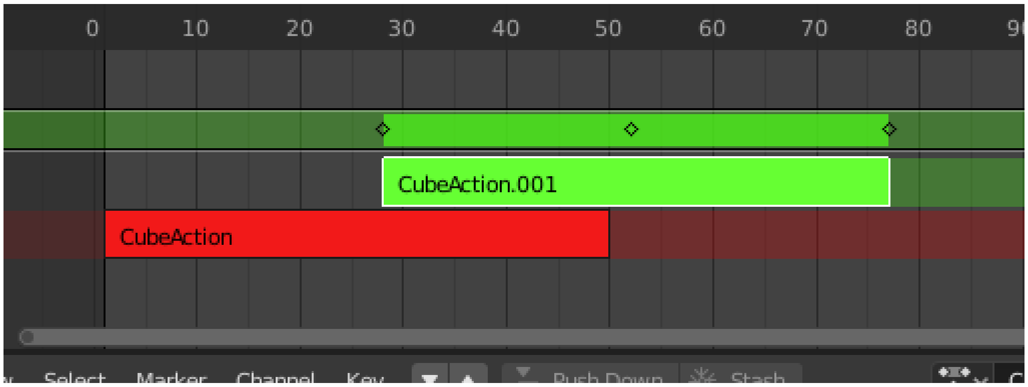
Linked Duplicate

Reference

Editor::	Nonlinear Animation
Menu::	*Strip ‣ Linked Duplicate*

Shortcut:: `Shift-D`

Creates copies of the selected strips, reusing any actions they reference. Editing the keyframes in a copied strip therefore also affects the original (and vice versa). Blender warns you about this by hilighting the other strip in red.


0
10
20
30
40
50
60
70
80
CubeAction.001
CubeAction
Select
Marker
Channel
Key
Push Down
Stash

Linked duplicated strip being edited.

Delete

Reference

Editor:: Nonlinear Animation
Menu:: *Strip* ▸ *Delete*
Shortcut:: `Delete`, `X`

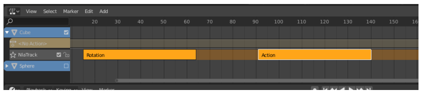
Deletes the selected NLA-Strips.

Make Meta

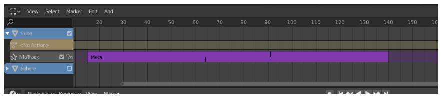
Reference

Editor:: Nonlinear Animation
Menu:: *Add* ▸ *Make Meta*
Shortcut:: `Ctrl-G`

Groups the selected NLA-strips into a meta strip.


View
Select
Marker
Edit
Add
Cube
NlaTrack
Sphere
Rotation
Action

Select two or more strips.


View
Select
Marker
Edit
Add
Cube
NlaTrack
Sphere
Meta

Combine them into a meta strip.

Remove Meta

Reference

Editor::	Nonlinear Animation
Menu::	*Strip* ▸ *Remove Meta*
Shortcut::	`Ctrl-Alt-G`

Ungroups the selected meta strips, replacing them by their contents.

Toggle Muting

Reference

Editor::	Nonlinear Animation
Menu::	*Strip* ▸ *Toggle Muting*
Shortcut::	`H`

Mutes or unmutes the selected strips. Muted strips have a dotted border and don’t influence the animation.

Bake Action

Reference

Editor:: Nonlinear Animation
Menu:: *Strip ‣ Bake Action*

Reference

Editor:: 3D Viewport
Mode:: Object and Pose Modes
Menu:: *Header ‣ Object ‣ Animation ‣ Bake Action…*

The final motion of objects and bones depends not only on the keyframed animation, but also on F-Curve modifiers, drivers, and constraints. The *Bake Action* operator computes this final motion and creates a corresponding keyframe on every scene frame.

This can be useful for adding deviation to a cyclic action like a Walk Cycle, or to create a keyframe animation from drivers or constraints.

Start Frame
Start frame for baking.

End Frame
End frame for baking.

Frame Step
Number of frames to skip forward while baking each frame.

Only Selected Bones
Only key selected bones (Pose baking only).

Visual Keying
Keyframe from the final transformations (with constraints applied).

Clear Constraints
Remove all constraints from keyed object/bones, and do ‘visual’ keying.

Clear Parents
Bake animation onto the object then clear parents (objects only).

Overwrite Current Action
Bake animation into the current action instead of creating a new one (useful for baking only part of bones in an armature).

Clean Curves
After baking curves, remove redundant keys.

Bake Data
Which data's transformations to bake.

Pose::	Bake bone transformations.
Object::	Bake object transformations.

Channels
Which channels to bake.

Location::	Bake location channels.
Rotation::	Bake rotation channels.
Scale::	Bake scale channels.
B-Bone::	Bake B-Bone channels.
Custom Properties::	Bake custom properties.

Apply Scale

Reference

Editor::	Nonlinear Animation
Menu::	*Strip* ‣ *Apply Scale*
Shortcut::	`Ctrl-A`

Applies the scale of the selected strips to their referenced actions.

Clear Scale

Reference

Editor:: Nonlinear Animation
Menu:: *Strip ‣ Clear Scale*
Shortcut:: `Alt-S`

Resets the scale of the selected strips.

Sync Action Length

Reference

Editor:: Nonlinear Animation
Menu:: *Strip ‣ Sync Action Length*

Resets the strip's length to that of its underlying action, ensuring that it (only) plays from the action's first keyframe to its last.

See also

The Sync Length Now button in the Sidebar, which does the same thing.

Make Single User

Reference

Editor:: Nonlinear Animation
Menu:: *Strip ‣ Make Single User*
Shortcut:: `U`

Duplicates actions where necessary so that each selected strip has its own action that's not used by any others. This way, you can edit the keyframes in the selected strips knowing that you won't affect any other part of the animation.

Note

This does not recursively go inside meta strips.

Start Editing Stashed Action

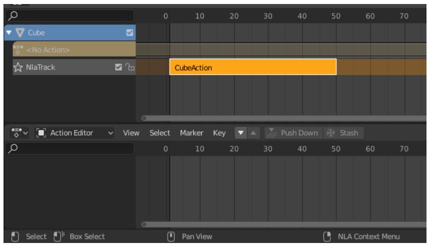
Reference

Editor::	Nonlinear Animation
Menu::	*Strip* ‣ *Start Editing Stashed Action*
Shortcut::	`Shift-Tab`

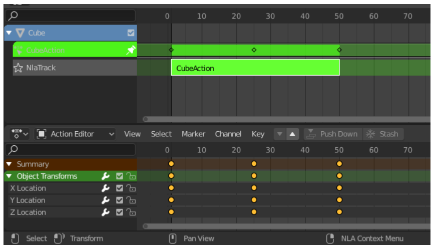
Enters Tweak Mode for the selected strip's action, making its keyframes available for editing in e.g. the Graph Editor. In addition, marks the strip's track as *Solo*, muting all the other tracks – this way, they no longer influence the animation and you can focus exclusively on the action you're editing.

While the menu item refers to stashed (muted) actions, this only reflects the typical use case. It works on unmuted actions as well.

When you're done editing, click *Strip* ‣ *Stop Editing Stashed Action* or press `Shift-Tab` again.


Cube
<No Action>
NlaTrack
CubeAction
Action Editor
View
Select
Marker
Key
Push Down
Stash
Select
Box Select
Pan View
NLA Context Menu

Strip in NLA mode.


Cube
NlaTrack
CubeAction
Action Editor
View
Select
Marker
Channel
Key
Push Down
Stash
Summary
Object Transforms
X Location
Y Location
Z Location
Select
Transform
Pan View
NLA Context Menu

Strip in Tweak mode.

Start Tweaking Strips Actions (Full Stack)

Reference

Editor::	Nonlinear Animation
Menu::	*Strip ‣ Start Tweaking Strips Actions (Full Stack)*
Shortcut::	`Tab`

Enters Tweak Mode for the selected strip's action, making its keyframes available for editing. Leaves all the other tracks enabled so that you can still see their effects while making changes.

When you're done, click *Strip ‣ Stop Tweaking Strips Actions* or press `Tab` again.

Note

For transitions above the tweaked strip, keyframe remapping will fail for channel values that are affected by the transition. A workaround is to tweak the active strip without evaluating the upper NLA stack.

Start Tweaking Strips Actions (Lower Stack)

Reference

Editor::	Nonlinear Animation
Menu::	*Strip ‣ Start Tweaking Strips Actions (Lower Stack)*

Enters Tweak Mode for the selected strip's action, making its keyframes available for editing. Mutes any tracks above the current one so that they don't influence the animation while making changes.

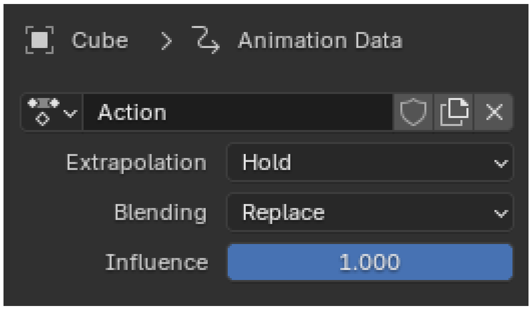
When you're done, click *Strip ‣ Stop Tweaking Strips Actions* or press `Tab`.

Sidebar

Edited Action

Reference

Panel:: *Sidebar ‣ Edited Action*


Cube > Animation Data

Action

Extrapolation: Hold

Blending: Replace

Influence: 1.000

Edited Action panel.

Contains settings for the object's active action. Only visible if the Action Track is selected.

Action

A data-block menu where you can see, change, and clear the object's active action. See also the Action Editor's Action.

Extrapolation

Determines whether the action will influence the frames before/after its boundaries once it has been pushed down into a strip. (As long as it's still the active action, *Hold* is used regardless of the choice.)

Hold

The property values at the action's first keyframe also apply to the earlier frames (if the strip is the first in the track). The values at its last keyframe also apply to the later frames (up to the next strip).

Hold Forward

The property values at the action's last keyframe also apply to the later frames (up to the next strip).

Nothing

The animated properties return to their default values outside of the strip boundaries.

Blending

How to combine the action's property values with those of the tracks below.

Replace

Overwrites the values produced by the lower tracks. If *Influence* is less than 1, a linear interpolation between the previous and new values is used instead.

Multiply, Subtract, Add

Blends the action's values with those of the lower tracks using a simple calculation. If *Influence* is less than 1, a linear interpolation between the previous values and these calculated values is used.

\(result = mix(previous, previous (+-×) value, influence)\)

Combine

Depending on the type of each property, one of the following methods is automatically chosen:

Axis/Angle Rotation

\(result = previous + value × influence\)

This results in averaging the axis and adding the amount of rotation.

Quaternion Rotation

Quaternion math is applied to all four channels of the property at once:

\(result = {previous} × {value} ^ {influence}\)

Proportional (Scale)

\(result = previous × (value / default) ^ {influence}\)

Others

\(result = previous + (value - default) × {influence}\)

Note

Since this blending mode uses quaternion multiplication to calculate the Quaternion Rotation properties, it always drives all four channels during playback, and *Insert Single Keyframe* is forced to insert all four keys. Other types of channels can still be keyed individually.

Influence

How much the action contributes to the result of the NLA stack.

Strip

Name

Name of the strip.

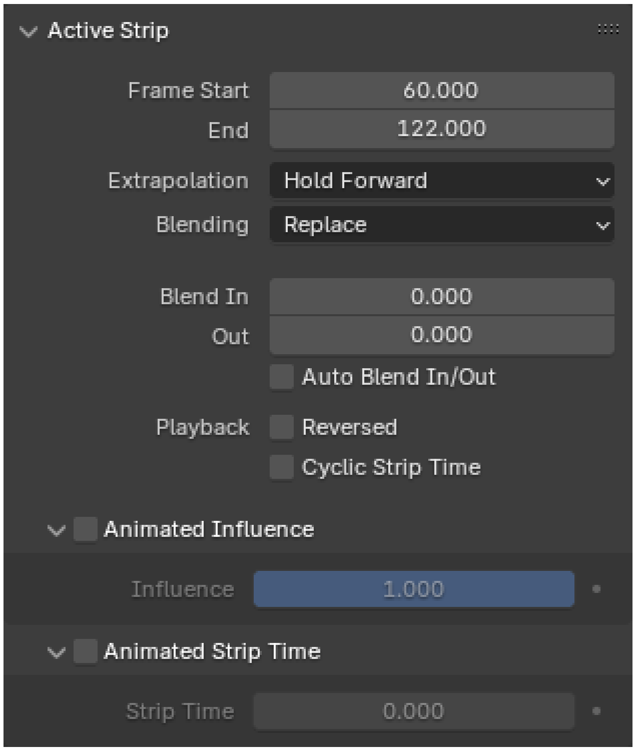
Mute (checkbox)

When unchecked, the strip will no longer contribute to the animation. It’s shown with a dotted outline to indicate this.

Active Strip

Reference

Panel::	*Sidebar ‣ Strip ‣ Active Strip*


Active Strip

Frame Start 60.000

End 122.000

Extrapolation Hold Forward

Blending Replace

Blend In 0.000

Out 0.000

☐ Auto Blend In/Out

Playback ☐ Reversed

☐ Cyclic Strip Time

☐ Animated Influence

Influence 1.000

☐ Animated Strip Time

Strip Time 0.000

Active Strip panel.

Contains common strip properties.

Frame Start
: The frame where the strip begins. Changing this will move the strip while keeping its duration constant.

Frame End
: The frame where the strip ends. Changing this will also change the *Action Clip Frame End*, thereby cropping or extending the action. If you instead want to speed it up or slow it down, scale it by using *Strip* ▸ *Transform* ▸ *Scale* or adjusting the *Playback Scale* setting.

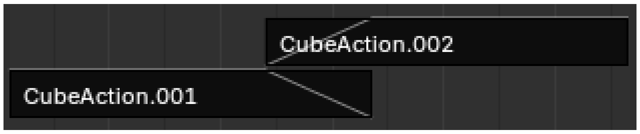
Extrapolation
: See Extrapolation.

Blending
: See Blending.

Blend In, Out

How many frames it takes for the strip's influence to ramp up at the start and wind down at the end.

Auto Blend In/Out
: Calculates *Blend In/Out* automatically by looking at the strips in the track above or below that overlap the current strip in time.



Two strips with Auto Blend enabled.

Playback

Reversed
: Makes the strip play backwards.

Cyclic Strip Time
: Whether to wrap the *Animated Strip Time* back to the start if it exceeds the Action Clip Frame End.

Animated Influence

Lets you manually specify, and animate, how strongly the strip affects the animation. This is an alternative to using the *(Auto) Blend In/Out* settings above.

To create an influence keyframe, first type a value, then either click *Insert Keyframe* in its context menu or press `I` while hovering over it. You can see the keyframes in e.g. the Graph Editor.

Animated Strip Time

Lets you manually specify, and animate, the frame at which the underlying action is sampled.

Note

Although the setting is called *Strip Time*, its value is a frame number inside the action, not inside the strip. If you have an action going from frame 1 to frame 50 that's referenced by a strip going from frame 101 to 150, you'd set the *Strip Time* to 1 to see the first keyframe, not 101.

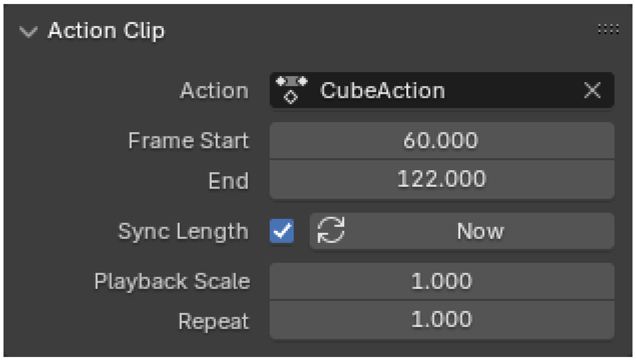
In combination with *Cyclic Strip Time*, this lets you play the action's keyframes multiple times in a single strip. As an example, say that the action's keyframes are between frames 1 and 50. If you animate the strip time to instead go from 1 to 100, the keyframes will play twice (at twice the speed).

In practice, however, it's easier to use the *Repeat* setting described below.

Action Clip

Reference

Panel:: *Sidebar region ‣ Strip ‣ Action Clip*



Action: CubeAction

Frame Start: 60.000

End: 122.000

Sync Length: ☑ Now

Playback Scale: 1.000

Repeat: 1.000

Action Clip panel.

Contains properties specific to Action strips.

Action
: The action referenced by the strip.

Frame Start, End
: How much of the action to use. By adjusting these, you can crop or extend the action (and the strip, as its *Frame End* will change

accordingly). If you extend the action, F-Curve Extrapolation will kick in.

One case where these settings can be useful is in cyclic animation where the first and last keyframes of the action have the same value (meaning this value applies for two frames when the animation restarts). By reducing the *Frame End*, you can exclude the last keyframe and have the value apply for only one frame instead.

Sync Length

Automatically sets *Frame Start/End* to the action's first/last keyframe when exiting Tweak Mode.

Now

Sets *Frame Start/End* to the action's first/last keyframe.

Playback Scale

Makes the animation play more quickly (scale < 1) or slowly (scale > 1) than the original action.

Repeat

Makes the action play multiple times.

Action

Reference

Panel:: *Sidebar region ‣ Strip ‣ Action*

See Action Properties.

Modifiers

Reference

Panel:: *Sidebar region ‣ Modifiers*

Strip modifiers let you make non-destructive changes to all the curves inside the strip's action.

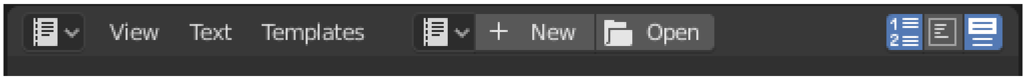
See F-Curve Modifiers.

Text Editor

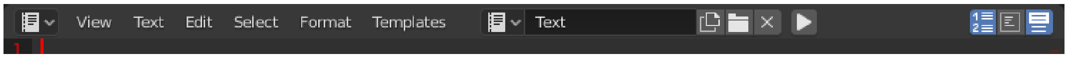
This editor can be used to write Python scripts, Open Shading Language scripts, or just plaintext notes. To open it, you can switch to the *Scripting* workspace or press `Shift-F11` to replace the current editor.

Header

The newly opened Text editor is empty, with a very simple header. More options become available when a text file is created or opened.



Text header.



Text header with a text loaded.

Editor Type

The standard editor selection button.

Menus

Editor’s menus.

Resolve Conflict

Resolves modified file conflicts when an external text file is updated from another program.

Reload from Disk

Opens the file from drive again, overriding any local changes.

Make Text Internal

Converts the external text data-block into an internal one.

Ignore

Hides the warning message until the external text file is modified externally again.

Text

A data-block menu to select a text or to create a new one. After that the header will change.

Run Script (play icon)

Executes the text as a Python script `Alt-P`. See Template Menu.

Show

Toggles for line numbers, word wrapping, and syntax highlighting.

Script Node Update (refresh icon)

When an OSL-file is opened, this updates the Shader Script node with new options and sockets from the script.

View Menu

Sidebar `Ctrl-T`

Show or hide the Sidebar.

Line Numbers

Displays the text file’s line numbers on the left of the Main View.

Word Wrap

Wraps words that don’t fit into the horizontal space by pushing them to a new “pseudo line”.

Syntax Highlight

Colors special words, in the Main View, that are used in the Python programming language.

Highlight Line

Emphasizes the active line by altering the color of the background.

Zoom In/Out

Increase/decrease the font size of text in the main view.

Navigation

Top `Ctrl-Home`

Moves the view and cursor to the start of the text file.

Bottom `Ctrl-End`

Moves the view and cursor to the end of the text file.

Line Begin `Home`

Moves the cursor to the start of the current line.

Line End `End`

Moves the cursor to the end of the current line.

Previous Line `Up`

Moves the cursor to the same position in the line above the current line.

Next Line `Down`

Moves the cursor to the same position in the line below the current line.

Previous Word `Ctrl-Left`

Moves the cursor to the beginning of the previous word. If the cursor is in the middle of a word, the cursor is moved to the beginning of the current word.

Next Word `Ctrl-Right`

Moves the cursor to the end of the next word. If the cursor is in the middle of a word, the cursor is moved to the end of the current word.

Text Menu

New `Alt-N`

Creates a new text Data Block.

Open `Alt-O`.
Loads an external text file that is selected via the File Browser.

Reload `Alt-R`
Reopens (reloads) the current buffer (all non-saved modifications are lost).

Edit Externally
Edit text file in external text editor. The external editor can be configured in the User Preferences.

Save `Alt-S`
Saves an already open file.

Save As `Shift-Ctrl-Alt-S`.
Saves text as a new text file. A File Browser is opened to select the directory to save the file along with giving the file a name and extension.

Register
Runs the text data-block as a Python script on loading the blend-file. Read more about the registration of Python modules in API documentation.

Live Edit
Runs the Python script each time you make a change.

Run Script `Alt-P`
Executes the text as a Python script. See Running Scripts for more information.

Edit Menu

Undo/Redo
See Undo & Redo.

Cut `Ctrl-X`
Cuts out the marked text into the clipboard.

Copy `Ctrl-C`
Copies the marked text into the clipboard.

Paste `Ctrl-V`
Pastes the text from the clipboard at the cursor location in the Text editor.

Duplicate Line `Ctrl-D`
Duplicates the current line.

Move Line(s) Up `Shift-Ctrl-Up`
Swaps the current/selected line(s) with the above.

Move Line(s) Down `Shift-Ctrl-Down`
Swaps the current/selected line(s) with the below.

Find & Replace `Ctrl-F`
Shows the *Find & Replace* panel in the Sidebar.

Find & Set Selection `Ctrl-G`
Finds the next instance of the selected text.

Jump To `Ctrl-J`
Shows a pop-up, which lets you select a line number where to move the cursor to.

Text Auto Complete `Tab`
Shows a selectable list of words already used in the text.

Text to 3D Object
Converts the text file to a Text Object either as *One Object* or *One Object Per Line*.

Select Menu

All `Ctrl-A`

Selects the entire text file.

Line `Shift-Ctrl-A`

Selects the entire current line.

Word double-click `LMB`

Selects the entire current word.

Top `Shift-Ctrl-Home`

Selects everything above the cursor.

Bottom `Shift-Ctrl-End`

Selects everything below the cursor.

Line Begin `Shift-Home`

Selects everything between the beginning of the current line and the cursor.

Line End `Shift-End`

Selects everything between the cursor and the end of the current line.

Previous Line `Shift-Up`

Selects everything between the cursor and the position of the cursor one line above.

Next Line `Shift-Down`

Selects everything between the cursor and the position of the cursor one line below.

Previous Word `Shift-Ctrl-Left`

Selects everything between the cursor and the beginning of the previous word. If the cursor is in the middle of a word, select everything to the beginning of the current word.

Next Word `Shift-Ctrl-Right`

Selects everything between the cursor and the end of the next word. If the cursor is in the middle of a word, select everything to the end of the current word.

Format Menu

Indent `Tab`
: Inserts a tab character at the cursor.

Unindent `Shift-Tab`.
: Unindents the selection.

Toggle Comments `Ctrl-Slash`.
: Toggles whether the selected line(s) are a Python comment. If no lines are selected, the current line is toggled.

Convert Whitespace
: Converts indentation characters *To Spaces* or *To Tabs*.

Template Menu

Contains a number of templates for both Python and Open Shading Language scripts.

Main View

Typing on the keyboard produces text in the text buffer.

As usual, pressing, dragging and releasing `LMB` selects text. Pressing `RMB` opens the context menu.

Tip

The Text editor is also handy when you want to share your blend-file with others: you can leave a note that explains how the file is structured. Be sure to keep the editor visible when saving so they'll see it!

Sidebar

Find & Replace

Find Text `Ctrl-F`

Searches for instances of a text that occur after the cursor. Using the eyedropper icon will search for the currently selected text and sets the selection to the match. *Find Next* searches for the next instance of the text.

Replace Text `Ctrl-H`

Searches for the text specified in *Find Text* and replaces it with the new text. Using the eyedropper icon will set the currently selected text as the replace text. *Replace* searches for the next match and replaces it. *Replace All* searches for the match and replaces all occurrences of the match with the new text.

Case

Search is sensitive to uppercase and lowercase letters.

Wrap

Search again from the start of the file when reaching the end.

All

Search in all text data-blocks instead of only the active one.

Properties

Margin

Shows a vertical margin line to help keep text lines at a reasonable length. The position of this margin line is specified by *Margin Column*.

Font Size `Ctrl-WheelUp`

The size of the font used to display text.

Tab Width

The number of character spaces to display tab characters with.

Indentation

Whether to use *Tabs* or *Spaces* for indentation.

Footer

The Text editor footer displays whether the text is saved internally or externally and if there are unsaved changes to an external file. For external files, this region also displays the file path to the text file.

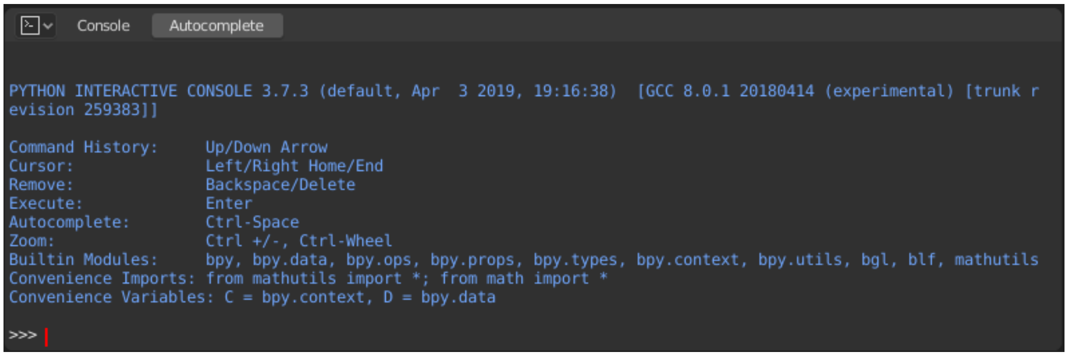
Usage

Running Scripts

The most notable keystroke is `Alt-P` which executes the current text as a Python script. You can access not just the standard Python modules, but also a whole bunch of Blender-specific ones; see Scripting & Extending Blender.

Python Console

The Python Console offers a quick way to test code snippets and explore Blender’s API. It executes whatever you type on its >>> prompt and has command history and auto-complete.



```
PYTHON INTERACTIVE CONSOLE 3.7.3 (default, Apr  3 2019, 19:16:38)  [GCC 8.0.1 20180414 (experimental) [trunk r
evision 259383]]

Command History:     Up/Down Arrow
Cursor:              Left/Right Home/End
Remove:              Backspace/Delete
Execute:             Enter
Autocomplete:        Ctrl-Space
Zoom:                Ctrl +/-, Ctrl-Wheel
Builtin Modules:     bpy, bpy.data, bpy.ops, bpy.props, bpy.types, bpy.context, bpy.utils, bgl, blf, mathutils
Convenience Imports: from mathutils import *; from math import *
Convenience Variables: C = bpy.context, D = bpy.data

>>> 
```

Python Console.

Interface

Header Menus

View Menu

Zoom In / Zoom Out
: Increases/decreases the font size.

Move to Previous Word `Ctrl-Left`
: Moves the cursor to the beginning of the previous word. If the cursor is in the middle of a word, the cursor is moved to the beginning of the current word.

Move to Next Word `Ctrl-Right`
: Moves the cursor to the end of the next word. If the cursor is in the middle of a word, the cursor is moved to the end of the current word.

Move to Line Begin `Home`

Moves the cursor to the start of the current line.

`Shift-Home`: Selects all text between the cursor and the start of the current line.

Move to Line End `End`

Moves the cursor to the end of the current line.

`Shift-End`: Selects all text between the cursor and the end of the current line.

Console Menu

Clear All

Refreshes the console, giving the view a fresh start. Note that command history is not cleared.

Clear Line `Shift-Return`.

Removes everything from the prompt line.

Delete Previous Word `Ctrl-Backspace`

Deletes everything between the cursor and the beginning of the previous word (separated by periods). If the cursor is in the middle of a word, deletes everything to the beginning of the current word.

Delete Next Word `Ctrl-Delete`

Deletes everything between the cursor and the end of the next word. If the cursor is in the middle of a word, deletes everything to the end of the current word.

Copy as Script `Shift-Ctrl-C`

Copies the full history buffer to the clipboard. This can be pasted into a text file to be used as a Python script.

Cut `Ctrl-X`

Copies the selected text into the clipboard and deletes it.

Copy `Ctrl-C`
Copies the selected text into the clipboard.

Paste `Ctrl-V`
Pastes into the command line.

Indent `Tab`
Inserts a tab character at the cursor.

Unindent `Shift-Tab`
Unindents the selection.

Backward in History `Up`
Changes the current command to the previous one from the command history.

Forward in History `Down`
Changes the current command to the next one from the command history.

Autocomplete `Tab`
See Auto Completion.

Main View

Key Bindings

- `LMB` – Moves the cursor along the input line.
- `Left` / `Right` – Moves the cursor by one character.
- `Ctrl-Left` / `Ctrl-Right` – Moves the cursor by one word.
- `Shift-Left` / `Shift-Right` – Selects characters to the left/right.
- `Shift-Ctrl-Left` / `Shift-Ctrl-Right` – Selects words to the left/right.
- `Ctrl-A` Selects all text and text history.
- `Backspace` / `Delete` – Erase characters.
- `Ctrl-Backspace` / `Ctrl-Delete` – Erase words.
- `Return` – Execute command.
- `Shift-Return` – Add to command history without executing.

Usage

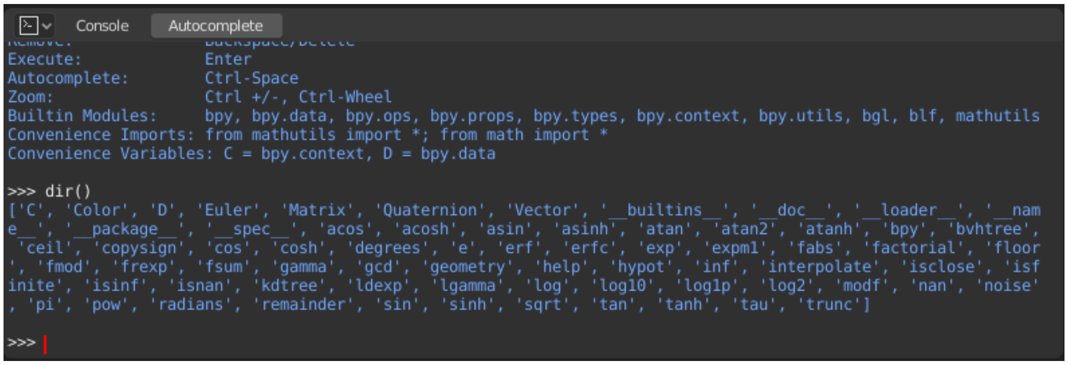
Aliases

Some variables and modules are available for convenience:

- `C`: Quick access to `bpy.context`.
- `D`: Quick access to `bpy.data`.
- `bpy`: Top level Blender Python API module.

First Look at the Console Environment

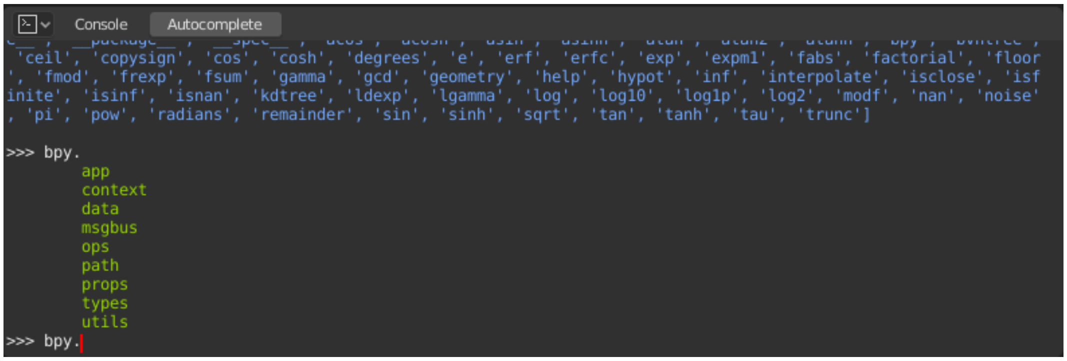
To see the list of global functions and variables, type `dir()` and press `Return` to execute it.



```
Execute:               Enter
Autocomplete:          Ctrl-Space
Zoom:                  Ctrl +/-, Ctrl-Wheel
Builtin Modules:       bpy, bpy.data, bpy.ops, bpy.props, bpy.types, bpy.context, bpy.utils, bgl, blf, mathutils
Convenience Imports: from mathutils import *; from math import *
Convenience Variables: C = bpy.context, D = bpy.data

>>> dir()
['C', 'Color', 'D', 'Euler', 'Matrix', 'Quaternion', 'Vector', '__builtins__', '__doc__', '__loader__', '__nam
e__', '__package__', '__spec__', 'acos', 'acosh', 'asin', 'asinh', 'atan', 'atan2', 'atanh', 'bpy', 'bvhtree',
 'ceil', 'copysign', 'cos', 'cosh', 'degrees', 'e', 'erf', 'erfc', 'exp', 'expm1', 'fabs', 'factorial', 'floor
', 'fmod', 'frexp', 'fsum', 'gamma', 'gcd', 'geometry', 'help', 'hypot', 'inf', 'interpolate', 'isclose', 'isf
inite', 'isinf', 'isnan', 'kdtree', 'ldexp', 'lgamma', 'log', 'log10', 'log1p', 'log2', 'modf', 'nan', 'noise'
, 'pi', 'pow', 'radians', 'remainder', 'sin', 'sinh', 'sqrt', 'tan', 'tanh', 'tau', 'trunc']

>>> 
```

Auto Completion

The Console can preview the available members of a module or variable. As an example, type `bpy.` and press `Tab`:



```
 'ceil', 'copysign', 'cos', 'cosh', 'degrees', 'e', 'erf', 'erfc', 'exp', 'expm1', 'fabs', 'factorial', 'floor
', 'fmod', 'frexp', 'fsum', 'gamma', 'gcd', 'geometry', 'help', 'hypot', 'inf', 'interpolate', 'isclose', 'isf
inite', 'isinf', 'isnan', 'kdtree', 'ldexp', 'lgamma', 'log', 'log10', 'log1p', 'log2', 'modf', 'nan', 'noise'
, 'pi', 'pow', 'radians', 'remainder', 'sin', 'sinh', 'sqrt', 'tan', 'tanh', 'tau', 'trunc']

>>> bpy.
        app
        context
        data
        msgbus
        ops
        path
        props
        types
        utils
>>> bpy.
```

The submodules are listed in green. Attributes and methods will be listed in the same way, with methods being indicated by a trailing `(`.

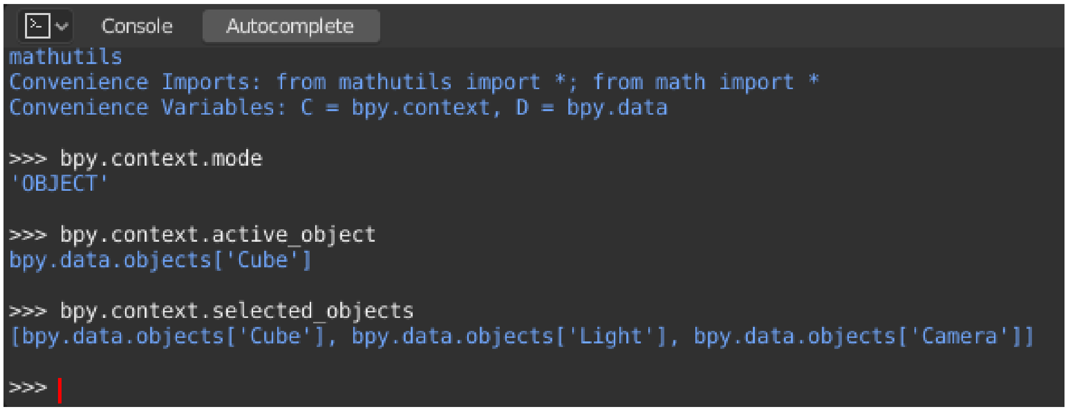
Examples

bpy.context

This module gives you access to the current scene, the currently selected objects, the current object mode, and so on.

Note

For the commands below to show the proper output, make sure you have selected object(s) in the 3D Viewport.



```
mathutils
Convenience Imports: from mathutils import *; from math import *
Convenience Variables: C = bpy.context, D = bpy.data

>>> bpy.context.mode
'OBJECT'

>>> bpy.context.active_object
bpy.data.objects['Cube']

>>> bpy.context.selected_objects
[bpy.data.objects['Cube'], bpy.data.objects['Light'], bpy.data.objects['Camera']]

>>> 
```

Get the current 3D Viewport mode (Object, Edit, Sculpt, etc.):

```
bpy.context.mode
```

Get the active object:

```
bpy.context.object
bpy.context.active_object
```

Change the active object's X coordinate to 1:

```
bpy.context.object.location.x = 1
```

Move the active object by 0.5 along the X axis:

```
bpy.context.object.location.x += 0.5
```

Change all three location coordinates in one go:

```
bpy.context.object.location = (1, 2, 3)
```

Change only the X and Y coordinates:

```
bpy.context.object.location.xy = (1, 2)
```

Get the selected objects:

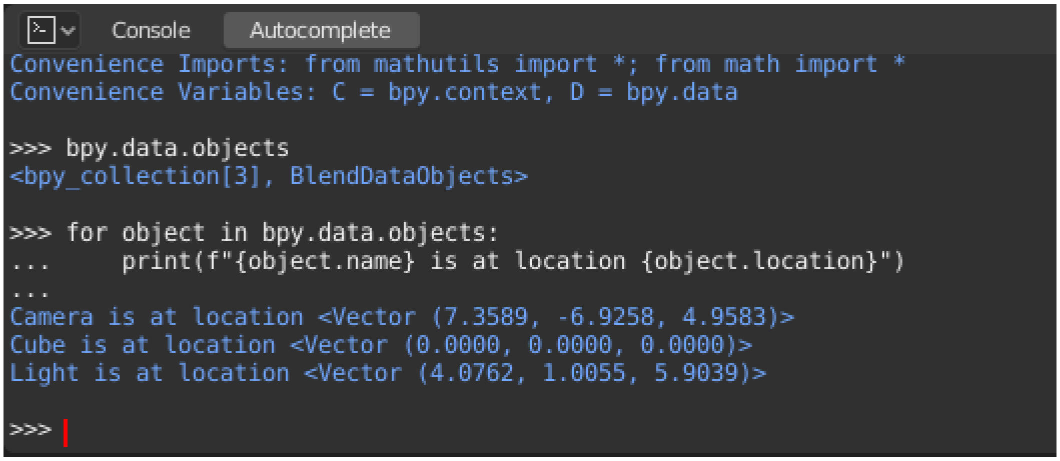
```
bpy.context.selected_objects
```

Get the selected objects excluding the active one:

```
[obj for obj in bpy.context.selected_objects if obj !=
bpy.context.object]
```

bpy.data

Gives you access to all the data in the blend-file, regardless of whether it's currently active or selected.



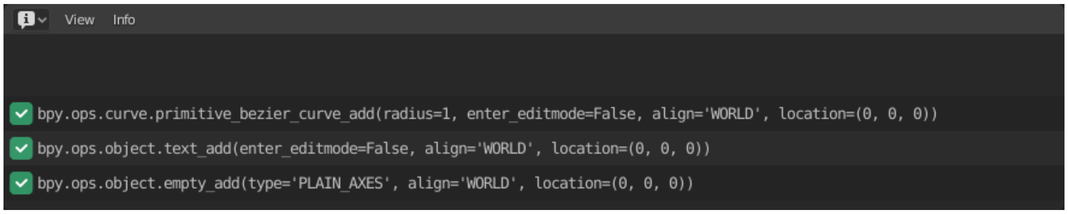
```
Convenience Imports: from mathutils import *; from math import *
Convenience Variables: C = bpy.context, D = bpy.data

>>> bpy.data.objects
<bpy_collection[3], BlendDataObjects>

>>> for object in bpy.data.objects:
...     print(f"{object.name} is at location {object.location}")
...
Camera is at location <Vector (7.3589, -6.9258, 4.9583)>
Cube is at location <Vector (0.0000, 0.0000, 0.0000)>
Light is at location <Vector (4.0762, 1.0055, 5.9039)>

>>> 
```

bpy.ops

“Operators” are actions that are normally triggered from a button or menu item but can also be called programmatically. See the bpy.ops API documentation for a list of all operators.

Info Editor

The Info editor logs the executed operators as well as errors, warnings, and informational messages. You can select an entry by clicking it, optionally holding `Shift` to add it to the existing selection.



```
bpy.ops.curve.primitive_bezier_curve_add(radius=1, enter_editmode=False, align='WORLD', location=(0, 0, 0))
bpy.ops.object.text_add(enter_editmode=False, align='WORLD', location=(0, 0, 0))
bpy.ops.object.empty_add(type='PLAIN_AXES', align='WORLD', location=(0, 0, 0))
```

Info Editor.

Interface

View Menu

Area
: Area controls. See the user interface documentation for more information.

Info Menu

Select All `A`
: Selects all entries.

Deselect All `Alt-A`
: Deselects all entries.

Invert Selection `Ctrl-I`
: Selects non-selected entries and deselects selected ones.

Toggle Selection

Selects all entries if there are currently no selected ones, and deselects them otherwise.

Box Select `B`
: Lets you drag a box and adds the entries that overlap it to the selection.

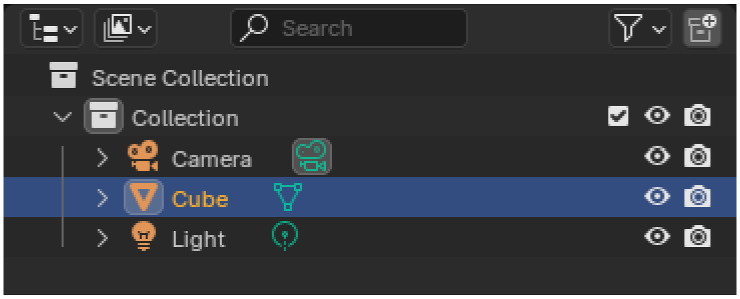
Delete `X`, `Delete`
: Removes the selected entries from the log.

Copy `Ctrl-C`
: Copies the selected entries to the clipboard.

Outliner

- Introduction
- Interface
- Selecting
- Editing
- Usage

Introduction



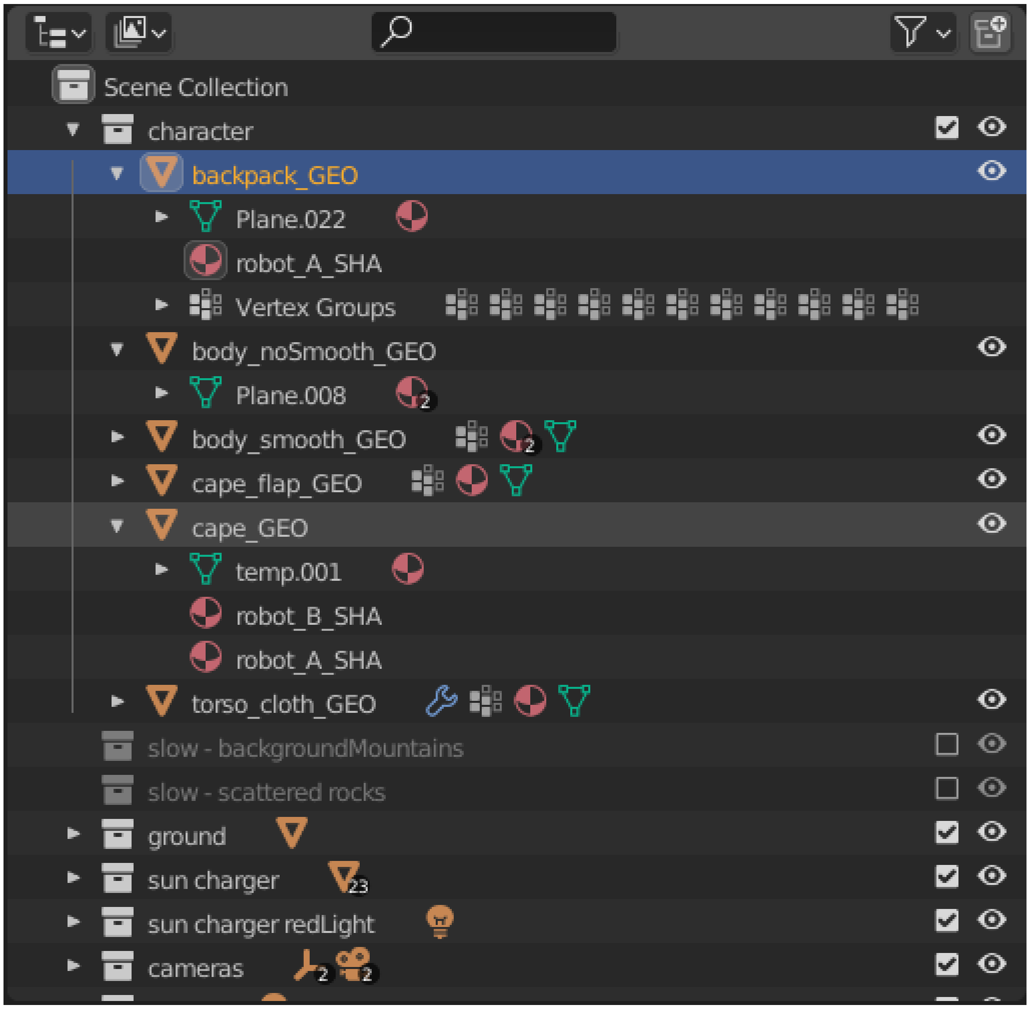
The Outliner editor.

The *Outliner* shows the content of the blend-file in a tree. You can use it to:

- Get an overview of the data in the scene.
- Select and deselect objects.
- Make objects unselectable or invisible in the 3D Viewport.
- Exclude objects from rendering.
- Duplicate objects.
- Delete objects.
- Manage parent/child relationships and collections.

Items with an arrow on the left can be expanded. Click it with `LMB` to expand a single item, drag `LMB` to expand multiple items, or click `Shift-LMB` to expand an item recursively.

Example


Scene Collection
character
backpack_GEO
Plane.022
robot_A_SHA
Vertex Groups
body_noSmooth_GEO
Plane.008
2
body_smooth_GEO
2
cape_flap_GEO
cape_GEO
temp.001
robot_B_SHA
robot_A_SHA
torso_cloth_GEO
slow - backgroundMountains
slow - scattered rocks
ground
sun charger
23
sun charger redLight
cameras
2
2

The Outliner with different kinds of data.

Interface

Header

Display Mode

This header dropdown lets you choose what the Outliner should show.

Scenes:: Shows the view layers, collections, and objects across all scenes.

View Layer:: Shows the collections and objects in the current view layer of the current scene.

Video Sequencer:: Shows the images and videos that are used in the Video Sequencer.

Blender File:: Lists all data in the current blend-file. On the right side of the list, a shield icon shows the number of users – clicking it adds or removes a fake user.

Data API:: Lists every data-block in the file along with any properties that it might have.

Library Overrides:: Shows the library overrides. Separated further into two view modes:

- **Properties::** Shows the data-blocks that have overridden properties in a list grouped by type. You can expand each data-block to see and change these properties.
- **Hierarchies::**

	Shows the overridden data-blocks in a tree that visualizes their hierarchy. This includes parent data-blocks that were overridden implicitly. For example, if you created an override for a material, this tree would show the hierarchy object > mesh > material. This view also shows a column of icons on the right that let you toggle whether each override is editable.
Unused Data::	Lists the data-blocks that are unused or only have a fake user. You can add/remove a fake user by clicking the shield icon on the right. Unused data-blocks are automatically deleted when saving and reloading the file. You can also delete them manually by clicking *Purge* in the header.

Search

The textbox lets you filter the tree by typing a substring. You can focus it using `Ctrl-F` or clear it using `Alt-F`.

Filter

The funnel icon in the header offers further control over what is displayed in the editor. Depending on the *Display Mode*, some options are not available.

Restriction Toggles
    Set which Restriction Toggles should be visible.

Sort Alphabetically
    Sort the entries alphabetically.

Sync Selection

Whether to synchronize the Outliner selection to and from the 3D Viewport and Video Sequencer editors.

Show Mode Column

Show the column for toggling the object interaction mode.

Search

Exact Match

Only show the items whose name fully matches the search text rather than only containing it as a substring.

Case Sensitive

Take lower/upper case into account when comparing the search text to the item names.

Filter

All View Layers

Show all the view layers in the scene instead of only the active one. Combined with disabling the *Objects* filter, this gives a compact overview of all the collections in relation to the view layers.

Collections

Show the collections in the scene hierarchy. Only the collections themselves are hidden when this option is disabled; the objects within them remain visible.

Objects

Show the objects in the scene hierarchy. Disabling this gives you an overview of just the collections.

Object State

List the objects based on their state or restrictions. The results can be inverted using the *Invert* toggle button.

All:: Show all objects.

Visible::	Only show the objects that are visible in the 3D Viewport. This takes both the *Hide in Viewports* and *Disable in Viewports* settings into account; see Restriction Toggles.
Selected::	Only show the object(s) that are currently selected in the 3D Viewport.
Active::	Only show the active object (typically the one that was selected last).
Selectable::	Only show the objects that can be selected in the 3D Viewport; see Restriction Toggles.

Object Contents

List relevant materials, modifiers, mesh data and so on as children of each object.

Object Children

Show child objects as child nodes in the Outliner tree. When disabled, child objects are shown as sibling nodes instead (unless they're in a different collection than their parent, in which case they're not shown in the parent's collection at all).

Meshes/Lights/…

Lets you filter out objects by type.

System Overrides

Shows the data-block properties that are defined/controlled automatically (e.g. to make data-blocks point to overridden data instead of the original). Only available in the *Library Overrides* Display Mode.

Miscellaneous

Some options in the header will only show if compatible with the active Display Mode.

New Collection *View Layer*

Add a new collection inside the selected one.

Filter by Type *Blender File Unused Data*

Restrict the type of the data-blocks shown in the Outliner.

Keying Sets (Data API) *Data API*
Add/Remove the selected property to/from the active Keying Set.

Drivers
Add/Remove Drivers to the selected item.

Purge (Orphan Data) *Unused Data*
Opens a dialog to remove unused data-blocks from both the current blend-file or any Linked Data (cannot be undone).

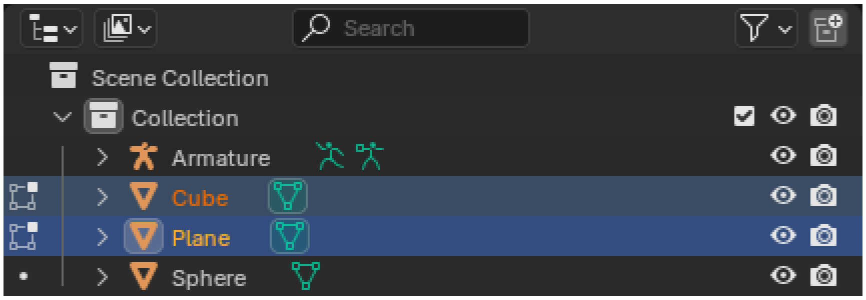
Local Data-Blocks
Removes unused data-blocks from the current blend-file.

Linked Data-Blocks
Removes unused data-blocks from Linked Data.

Recursive Delete
Removes data-blocks only used by unused data-blocks, ensuring that no orphaned data-blocks remain after execution.

Main Region

Object Interaction Mode



Mode icons. Two objects are currently in Edit Mode; a third could be added.

If a selected object is in an interaction mode other than the default Object Mode, the Outliner shows an icon representing this mode on the left.

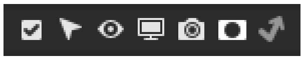
If the active object has such an icon, the Outliner also shows a dot next to objects of the same type. You can click such a dot to switch over to a different object while staying in the same mode.

If the mode supports Multi-Object Editing, you can also click a dot with `Ctrl-LMB` to *add* an object to the mode.

You can click the mode icon of the active object to switch it (and any other objects in case of Multi-Object Editing) back to Object Mode. You can also `Ctrl-LMB` the mode icon of a selected – but not active – object to switch only that object back to Object Mode.

Restriction Toggles

The right side of the Outliner shows a series of toggle icons for every collection, object, bone, modifier, and constraint. These can be used to make the item invisible, unselectable, and so on.



Restriction toggles.

Note

Only a few icons are shown by default. You can use the Filter pop-over to show additional ones.

Clicking an icon with `Shift-LMB` toggles it for the item and all its children.

Clicking a collection's icon with `Ctrl-LMB` enables it for the collection (and its parent/child collections) and disables it for all others. Clicking again enables it for the others again.

Exclude from View Layer (checkbox) *Collections*

Uncheck to disable the collection for the current View Layer. Its contents will be hidden in the 3D Viewport, the render, and even the Outliner.

Disable Selection (mouse cursor icon)

Toggles whether the object can be selected in the 3D Viewport. This can be useful for, say, references images that you only want to display and never select/move.

Hide in Viewports (eye icon)

Toggles the visibility of the object or collection in (only) the 3D Viewport, for the current view layer. The render is not affected.

As an alternative to clicking this icon, you can press `H` while hovering over the 3D Viewport to hide the selected objects, or `Alt-H` to unhide all objects.

This setting only applies within the current blend-file: when you Link or Append it to another blend-file, all collections and objects will be visible there.

Objects hidden this way are still part of the view layer, so they still get evaluated and affect playback performance.

See also

Collections can be hidden for individual 3D Viewports; see Local Collections in the Sidebar.

Disable in Viewports (screen icon)

Toggles the visibility of the object or collection in (only) the 3D Viewport, for all view layers. The render is not affected.

This setting is separate from *Hide in Viewports*. An object needs to have both settings enabled to be visible. You can use this one for “long-term invisibility,” keeping an object invisible even after pressing `Alt-H`.

This setting carries over to other blend-files when linking or appending.

Objects hidden this way are no longer part of the view layer, so they no longer get evaluated and don’t affect playback performance.

Disable in Renders (camera icon)

Toggles the visibility of the object or collection in (only) the render, for all view layers. The 3D Viewport is not affected.

This is typically used for supporting objects that help modeling and animation yet don't belong in the final image.

Holdout *Collections*

Makes the objects in the collection cut a fully transparent hole into the render output of the view layer.

See also

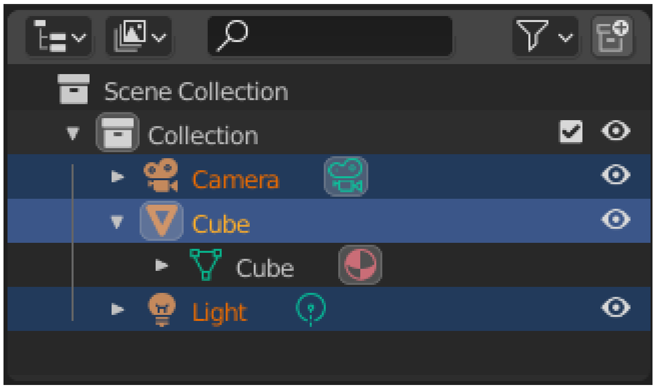
Holdout Shader Node

Indirect Only *Collections Cycles*

Objects in the collection only contribute to indirect light.

Selecting

Selection is done with `LMB` (and/or the context menu) on the row of a data-block. Single selections will also activate the data-block. The rows of selected data-blocks are highlighted blue, with the active data-block highlighted in a lighter blue.



Selected data-blocks with the Cube active.

Clicking in empty space below the list of data-blocks will deselect all.

Note

By default, selecting data-blocks in the Outliner will select the respective objects, bones, and sequences in the 3D Viewport and Video Sequencer. Selections in the 3D Viewport and Video Sequencer will be synced to each Outliner. To disable selection syncing, turn off the toggle in the filter popover.

Children of a data-block can also be selected by clicking the icon that is displayed to the right of the parent data-block's name.

Selecting Multiple Data-Blocks

Extend the selection one data-block at a time using `Ctrl-LMB`. Each data-block added to the selection this way will be made the active data-block.

Select a range of elements from the active element using `Shift-LMB`. To select a range without deselecting the previous selection, use `Shift-Ctrl-LMB`.

Select all children of an item by double clicking the item's icon.

A click and drag from any location in the Outliner other than a name or icon will begin a box selection. Use `Shift` to add and `Ctrl` to subtract from existing selections with box select. Box select can also be started with `B`.

To select all items use `A`; `Alt-A` will deselect all items.

The keyboard arrow keys can be used to navigate and select in the Outliner. Keyboard selection and navigation starts from the active data-block.

`Up`	Select the previous element in the list.
`Down`	Select the next element in the list.
`Shift-Up`	Select the previous element without deselecting.
`Shift-Down`	Select the next element without deselecting.
`Left`	Close the data-block or select the parent.
`Right`	Open the data-block to view children or select the first child.
`Shift-Left`	Close this and all child data-blocks.

`Shift-Right`	Open this and all child data-blocks.

Properties Editor Sync

When clicking the icon (not the name) of an item in the Outliner, the Properties editor will automatically switch to the relevant tab. This feature can be disabled using the Properties editor’s Sync with Outliner option.

Editing

Context Menu

Show the context menu for a data-block with `RMB` on the icon or name. Depending on the type of the selected data-block(s), you will have all or part of the following options:

Copy/Paste
    Copies/pastes the selected data-blocks.

Delete `X`, `Delete`
    Removes all usages of the selected data-blocks. Objects are removed from all scenes, materials are removed from all meshes, and so on.

Note

Pressing these shortcuts while hovering over the 3D Viewport will instead *Unlink* the selected objects, removing them only from the current scene.

Delete Hierarchy
    As above, but also affects child collections/objects. Note that if you run this on a collection, child objects that (also) belong to another collection will not be deleted.

Select
    Adds the items that are selected in the Outliner to the selection in the 3D Viewport. This is only useful when Sync Selection is disabled, as when it's enabled (which is the default), the Outliner selection is synchronized to the 3D Viewport automatically.

Select Hierarchy
    Adds the children of the selected items to the selection in the Outliner. If *Sync Selection* is enabled, this also adds them to the selection in the

3D Viewport.

Deselect

Removes the items that are selected in the Outliner from the selection in the 3D Viewport.

Unlink

Removes the current usage of the data-block while keeping any others. Objects are only removed from the current scene, materials are only removed from the current mesh, and so on.

Collections

Collections let you organize the content of a scene. They can contain objects as well as other collections.

New

Creates a new collection.

Duplicate Collections

Recursively duplicates the collection including all child collections, objects, and object data.

Duplicate Linked

Recursively duplicates the collection including child collections and objects, but reuses object data.

Instance to Scene

Creates a new collection instance.

Visibility

Controls the collection's visibility in the 3D Viewport and the final render.

Isolate

Shows the selected collection (as well as its child and parent collections) and hides all the others.

Show/Hide

Changes the Hide in Viewports setting for the selected collections.

Show/Hide Inside

Changes the Hide in Viewports setting for the selected collections and all their children.

Enable/Disable in Viewports

Changes the Disable in Viewports setting for the selected collections.

Enable/Disable in Renders

Changes the Disable in Renders setting for the selected collections.

View Layer

Controls the collection's interactions with the View Layer.

Disable/Enable in View Layer

Changes the Exclude from View Layer setting for the selected collections.

Set/Clear Holdout

Changes the Holdout setting for the selected collections.

Set Color Tag

Assigns or clears a collection's color tag for the selected collection.

ID Data

Unlink

Removes the current usage of the data-block while keeping any others (e.g. removing a material from only the current mesh).

Make Local

Turns an externally linked data-block into a local one.

Make Single User

This menu item is not currently functional. You can use the *User Count* button in the Data-Block Menu instead.

Delete
    Deletes the selected data-block.

Remap Users
    Replaces all usages of the selected data-block by a different one. For example, you could use this to globally replace a material by another.

Copy/Paste
    Copies/pastes selected data-blocks.

Add/Clear Fake User
    Adds/removes a fake user, which prevents unused data-blocks from getting automatically deleted when saving and reloading the blend-file.

Rename `F2`
    Renames the selected data-block.

Select Linked
    Selects the data-blocks that use the currently selected one (e.g. selecting all the objects that use the selected material). See Select Linked.

Mark as Asset

See Creating an Asset.

Clear Asset

See Removing Assets.

Clear Asset (Set Fake User)

See Removing Assets.

Library Override

See Library Overrides.

View

Show Active `Period`

Centers the tree view to the active item.

Expand/Collapse All `Shift-A`

Expands/collapses every single item in the tree.

Show Object Hierarchy `Home`

Expands all objects that have child objects, and collapses all objects that don't.

Show/Hide One Level `NumpadPlus`/ `NumpadMinus`

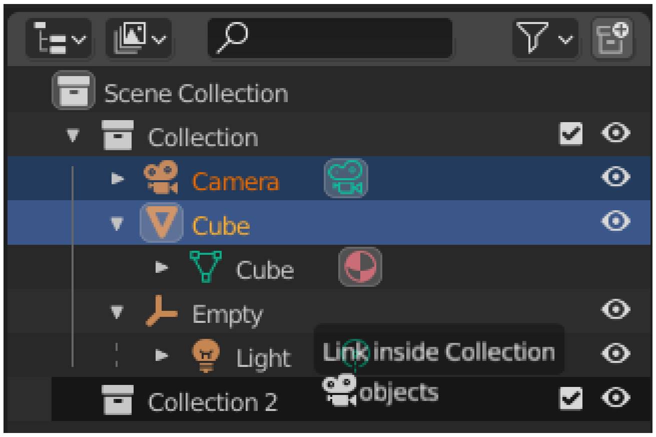
Expands/collapses a level down/up the tree across all items.

Usage

Relations Management

You can move an object (or collection) to a different parent collection by dragging and dropping.

You can link an object (or collection) to a parent collection by dragging and then holding `Ctrl` while dropping. This way, you can make the object (or child collection) part of multiple parent collections at the same time.



Scene Collection
Collection
Camera
Cube
Cube
Empty
Light
Link inside Collection
objects
Collection 2

Linking objects to a collection.

You can parent an object to another by dragging and then holding `Shift` while dropping.

Note

Drag and drop will attempt to operate on the entire selection. Selected data-blocks that are incompatible with the operation will remain unmodified.

Modifiers, Constraints, and Visual Effects

You can manage Modifiers, Constraints, and Visual Effects from the Outliner in a couple of ways:

- You can drag and drop individual items to change their order within the stack or to copy them to another object.
- You can drag and drop the group item (e.g. *Modifiers*) to copy the whole stack to another object. The target object's existing stack will be replaced.
- You can apply and delete items using the context menu.

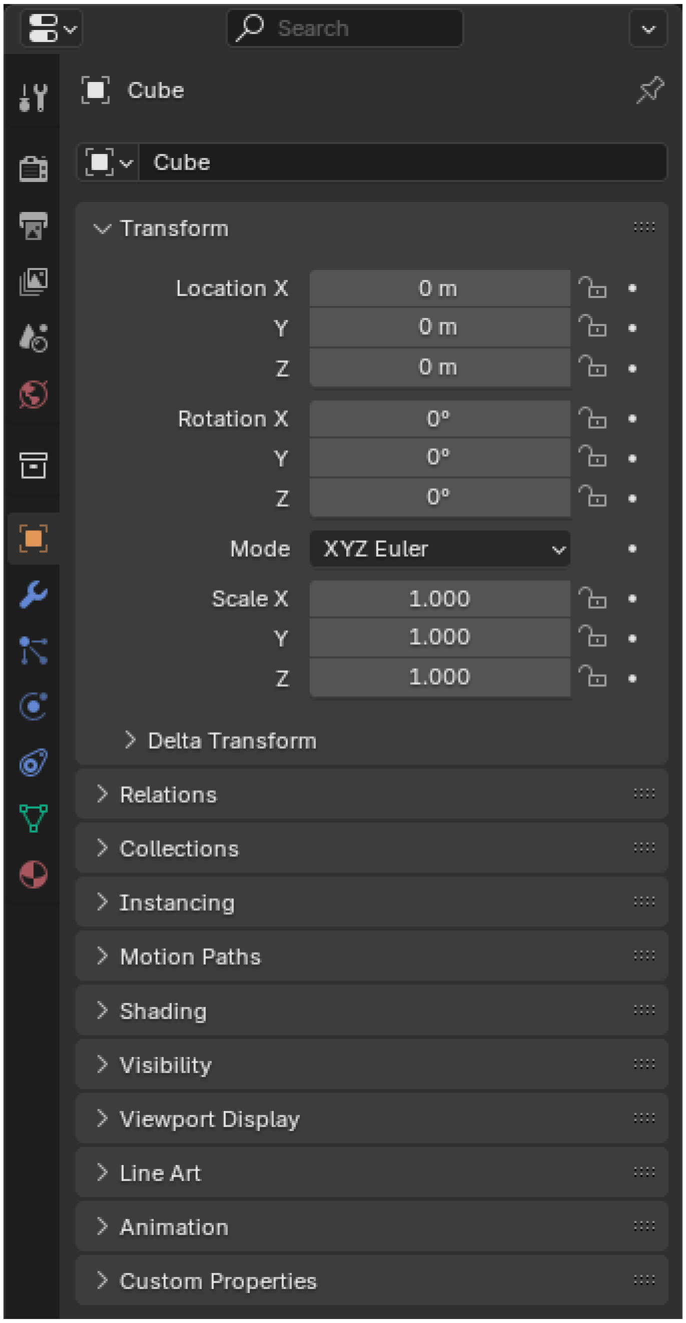
Drag & Dropping to 3D Viewport

Dragging an object from the Outliner to the 3D Viewport creates a duplicate – a new object with its own copy of the underlying object data.

Dragging object data from the Outliner to the 3D Viewport creates a linked duplicate – a new object that references the same underlying object data.

Properties

The Properties editor shows and allows editing of many active data, including the active scene and object.



Cube

Cube

Transform

Location X 0 m
Y 0 m
Z 0 m

Rotation X 0°
Y 0°
Z 0°

Mode XYZ Euler

Scale X 1.000
Y 1.000
Z 1.000

Search
Delta Transform
Relations
Collections
Instancing
Motion Paths
Shading
Visibility
Viewport Display
Line Art
Animation
Custom Properties

The Properties, with *Object* properties shown.

Tabs

The Properties editor has several categories, which can be chosen via tabs (the icons column to its left). Each tab regroups properties and settings of a data type, and is documented in its own manual sections, linked below.

Active Tool and Workspace Settings

This first tab contains settings for the active tool (in the 3D Viewport) and the current workspace.

Scene

These tabs contain settings for the active scene.

- Render: EEVEE, Cycles or Workbench settings
- Output
- View Layer
- Scene
- World

Collection

This tabs contain settings for the active Collection.

Object

These tabs are used to add features, and to change properties for the active object. Depending on the type of the active object, some of those will be hidden.

- Object
- Modifiers (or Grease Pencil Modifiers)
- Object Visual Effects
- Particles
- Physics

- Object Constraints

Object Data

The main tab of that category (often the only one) always has the same name, *Object Data*, but its icon will change based on the actual type of the active object.

Geometry Objects:

- Mesh
- Curve
- Surface
- Text
- Metaball
- Grease Pencil

Rigging and Deformation Objects:

- Armature
  - Bone
  - Bone Constraints
- Lattice

Other Types of Objects:

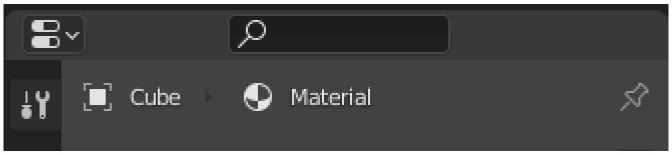
- Empty
- Speaker
- Camera
- Light
- Light Probe

Object Shading

Depending on the type of the active object, some of those will be hidden.

- Material
- Texture

Header



The header of the Properties.

Display Filter `Ctrl-F`
: Allows you to search for a property by its name. The results will be highlighted with there corresponding panel also highlighted and expanded. The search also works across multiple Tabs; graying out tabs with no search results. You can start a search using `Ctrl-F` or clear a search with `Alt-F`. This filter is useful if you do not remember where a property is within the Properties.

Data Context
: Just below the header is a list of icons and text items which show the owner of the properties being edited, together with some dependency context if needed. In the example above, the material "Material" is used by the active object "Cube".

Toggle Pin ID
: By toggling on the pin icon to the right, Blender will display only the currently shown data-block's properties in that editor, disregarding further selection changes. Toggle off that pin to switch back to default behavior, showing active data-block's properties.

Options

Sync with Outliner
: Sync tabs with the Outliner data-block selection. See Properties Editor Sync for more information.

Always::	Always, when possible, change Property editor tabs when clicking an icon in an Outliner.
Never::	Never change Property editor tabs when clicking an icon in an Outliner.
Auto::	Change tabs only when the Property editor shares a border with an Outliner.

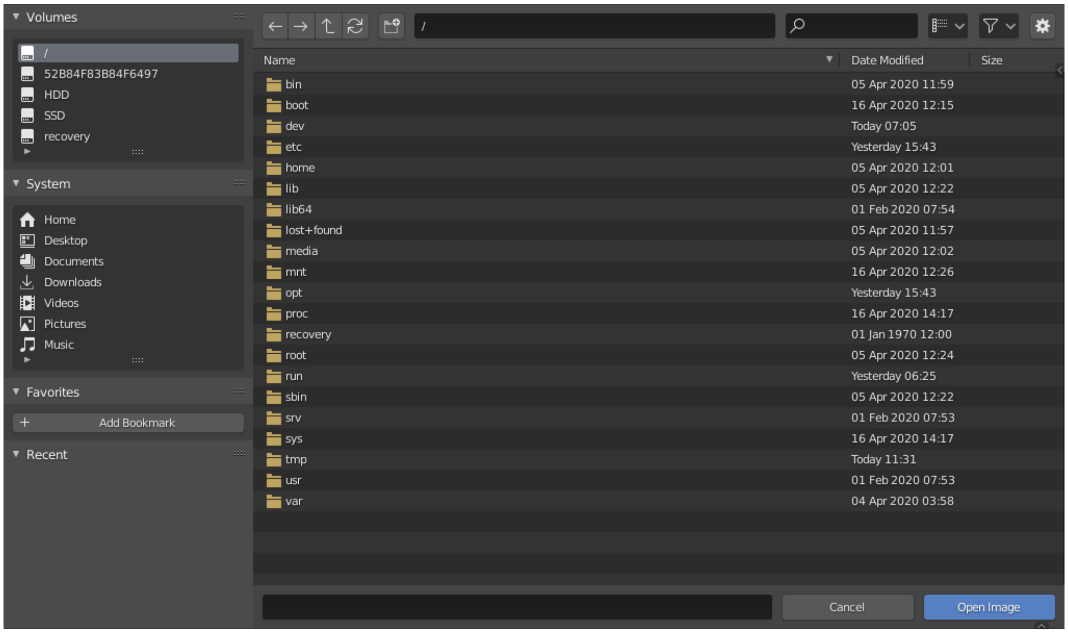
File Browser

The File Browser is used in all file-related operations. These include:

- Opening and saving blend-files.
- Browsing the content of other blend-files when appending or linking data-blocks (see Linked Libraries).
- Importing from/exporting to other file formats.
- Updating the locations of previously imported media (images, videos, fonts…).

The most common way to use this editor is through modal operators (like opening or saving a blend-file). The File Browser will appear in a new window, wait for you to select a file, and then close again.

You can also use the File Browser like a regular, permanently visible editor. In fact, the predefined Video Editing workspace uses it this way. This lets you drag-and-drop media from the browser straight into e.g. the 3D Viewport or the Video Sequencer, saving you some overhead.


Volumes
/
52B84F83B84F6497
HDD
SSD
recovery
System
Home
Desktop
Documents
Downloads
Videos
Pictures
Music
Favorites
Add Bookmark
Recent
/
Cancel
Open Image

Name	Date Modified	Size
bin	05 Apr 2020 11:59	
boot	16 Apr 2020 12:15	
dev	Today 07:05	
etc	Yesterday 15:43	
home	05 Apr 2020 12:01	
lib	05 Apr 2020 12:22	
lib64	01 Feb 2020 07:54	
lost+found	05 Apr 2020 11:57	
media	05 Apr 2020 12:02	
mnt	16 Apr 2020 12:26	
opt	Yesterday 15:43	
proc	16 Apr 2020 14:17	
recovery	01 Jan 1970 12:00	
root	05 Apr 2020 12:24	
run	Yesterday 06:25	
sbin	05 Apr 2020 12:22	
srv	01 Feb 2020 07:53	
sys	16 Apr 2020 14:17	
tmp	Today 11:31	
usr	01 Feb 2020 07:53	
var	04 Apr 2020 03:58	

The File Browser.

Interface

Main Region

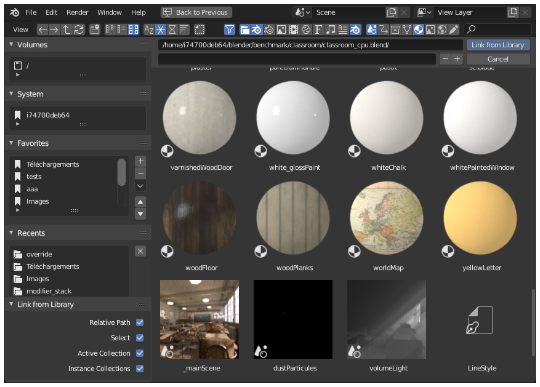
The main region lists files, folders, or blend-file contents. Hovering over an item will show a tooltip with extra information.

Previews

In its *Thumbnail* display mode, the File Browser supports many types of previews. These include:

- Image and video formats
- Fonts
- Blend-files
- Internal Data-blocks

In order to get previews for data-blocks, these must first be generated. See Blend-Files Previews.


File
Edit
Render
Window
Help
Back to Previous
Scene
View Layer
View
Volumes
/
System
i74700deb64
Favorites
Téléchargements
tests
aaa
Images
Recents
override
Téléchargements
Images
modifier_stack
Link from Library
Link from Library
Cancel
varnishedWoodDoor
white_glossPaint
whiteChalk
whitePaintedWindow
woodFloor
woodPlanks
worldMap
yellowLetter
_mainScene
dustParticules
volumeLight
LineStyle

/home/i74700deb64/blender/benchmark/classroom/classroom_cpu.blend/

Relative Path ☑
Select ☑
Active Collection ☑
Instance Collections ☑

The File Browser in *Thumbnail* mode.

Directory Region

Above the file list, there's a textbox showing the current folder path, along with buttons for navigating.

Previous Folder `Backspace`, `Alt-Left`, `Mouse4`
Move to previous folder in navigation history.

Next Folder `Shift-Backspace`, `Alt-Right` `Mouse5`
Move to next folder in navigation history.

Parent Directory `P`, `Alt-Up`
Move up to parent directory.

Refresh File List `R`, `NumpadPeriod`
Refresh current folder.

Create New Directory `I`
Create a new directory inside the current one.

Directory `Ctrl-L`
The current folder path. `Tab` will auto-complete an existing path. If you type a nonexistent path, you will be prompted to create it.

Search `Ctrl-F`
Filter items by name. The wildcard * will match anything, e.g. `bl*er` will match both `blender` and `blogger`. There is always an implicit wildcard at the start and end of the search text, so `blender` will also match `test_blender_file.blend`. This field can also be used to filter some specific file extension (e.g. `.png` will list all PNG files).

Display Mode
Control how files are displayed.

Vertical List::	Displays files and folders in a vertical list.
Horizontal List::	Displays files and folders in a horizontal list.
Thumbnails::	Shows previews.

Display Settings

Size
The size of the thumbnails.

Recursions

The number of directory levels to show at once in a flat way.

None::	List only the current directory's content.
Blend File::	List the whole content of a blend-file (only available when linking or appending data-blocks).
One Level::	List all subdirectories' content, one level of recursion.
Two Levels::	List all subdirectories' content, two levels of recursion.
Three Levels::	List all subdirectories' content, three levels of recursion.

Hint

Showing several levels of directories at once can be handy to e.g. see your whole collection of textures, even if you have arranged them in a nice set of directories to avoid having hundreds of files in a single place.

In the *Append/Link* case, showing the content of the whole blend-file lets you link different types of data-blocks in a single operation.

Warning

The more levels you show at once, the more time it will take to list them all.

Sort By

Sorts items by one of the four methods:

Name::	Sort the file list alphabetically.
Extension::	Sort the file list by extension/type.
Modified Date::	Sort files by modification time.
Size::	Sort files by size.

Filter Settings

The toggle with the funnel icon controls whether filtering is enabled or not. The dropdown button next to it shows the filtering options.

File Types
  Filters files by categories, like folders, blend-files, images, etc.

Blender IDs
  When appending or linking, you can also filter by data-block categories, like scenes, animations, materials, etc.

Show Hidden `H`
  Shows hidden files (starting with a `.`).

Execution Region

These controls are at the bottom of the editor.

File Name
  Text field to edit the file name and extension. Turns red to warn you about overwriting an existing file. `Tab` will auto-complete to existing names in the current directory.

  Increase/Decrease Number `+`, `-`
    Adds/increases or removes/decreases a trailing number in your file name (used e.g. to store different versions of a file).

Cancel `Esc`
  Closes the File Browser and cancels the operation.

Confirm `Return`
  Confirm the current directory and file name. You can also double-click a file or data-block in the main region.

Quick Access Region

The region on the left contains a few panels that let you quickly jump to certain directories with a single click.

Bookmarks

A custom list of folders that you use often. You can use the buttons to the right of the list to add/remove/move items.

System

Common directories such as the home directory in Linux or the "Documents" folder in Windows.

Volumes

Drives and network mounts.

Recent

Recently accessed folders.

Clicking the down arrow button to the right reveals *Clear Recent Items* to fully clear this list.

You can control how many folders appear in this list with the *Recent Files* number field of the Save & Load tab in the Preferences.

Operator Options Region

The right region shows the options of the calling operator. Besides the common actions listed below, many import/export add-ons will also expose their options there.

Open, Save, Save As Blender File
  See Opening & Saving.

Open, Replace, Save As Image
  See Supported Graphics Formats.

Link/Append from Library
  See Linked libraries.

For the common option:

Relative Path
  See Relative Paths.

Header Region

The header only contains two menus, one with the standard editor *View* controls and the other to list a few Selecting operators for the sake of discoverability. These menus are not visible when the browser is in a modal window.

Navigating

Entering a Directory `Return`
  Double-click a directory to enter it.

Parent Directory `P`
  Takes you up one level of directory.

File Drop

You can also drag and drop a file or directory from your file manager into the Blender File Browser. This will navigate to the item and select it.

Selecting

Select
  Click `LMB` to select a single item. Additionally hold `Ctrl` to add/remove that item to/from the selection, or `Shift` to select a range of items.

Dragging
Dragging with `LMB` starts a box selection.

Note

You can always select several entries in the File Browser – the last selected one is considered the active one. If the calling operation expects a single path (like e.g. the main blend-file *Open* one), it will get that active item's path, and the other selected items will be ignored.

Arrow Keys

It is also possible to select/deselect files by "walking" through them using the arrow keys:

- Press an arrow key to select the next/previous file in the list and deselect all the others.
- Hold `Shift` to keep the current selection (and add to it).
- Hold `Shift-Ctrl` to invert the selection as you pass over it.

If no file is selected, the arrow key navigation selects the first or last file in the directory, depending on the arrow direction.

Editing

The following operations are available in the file list's context menu.

External
Use the operating system to perform an action on the file or directory. The options listed below might not be available on all operating systems.

Open::	Open the file.
Open Folder::	Open the folder.
Edit::	Edit the file.
New::	Create a new file of this type.

Find File::	Search for files of this type.
Show::	Show this file.
Play::	Play this file.
Browse::	Browse this file.
Preview::	Preview this file.
Print::	Print this file.
Install::	Install this file.
Run As User::	Run as specific user.
Properties::	Show OS Properties for this item.
Find in Folder::	Search for items in this folder.
Command Prompt Here::	Open a command prompt here.

Delete `Delete`, `X`

Delete the currently selected files or directories by moving them to the operating system's "trash".

Note, on Linux deleting directories requires KDE or GNOME.

Rename `F2`

Change the name of the currently selected file or directory.

Asset Browser

The *Asset Browser* is the main interface for organizing and using assets.

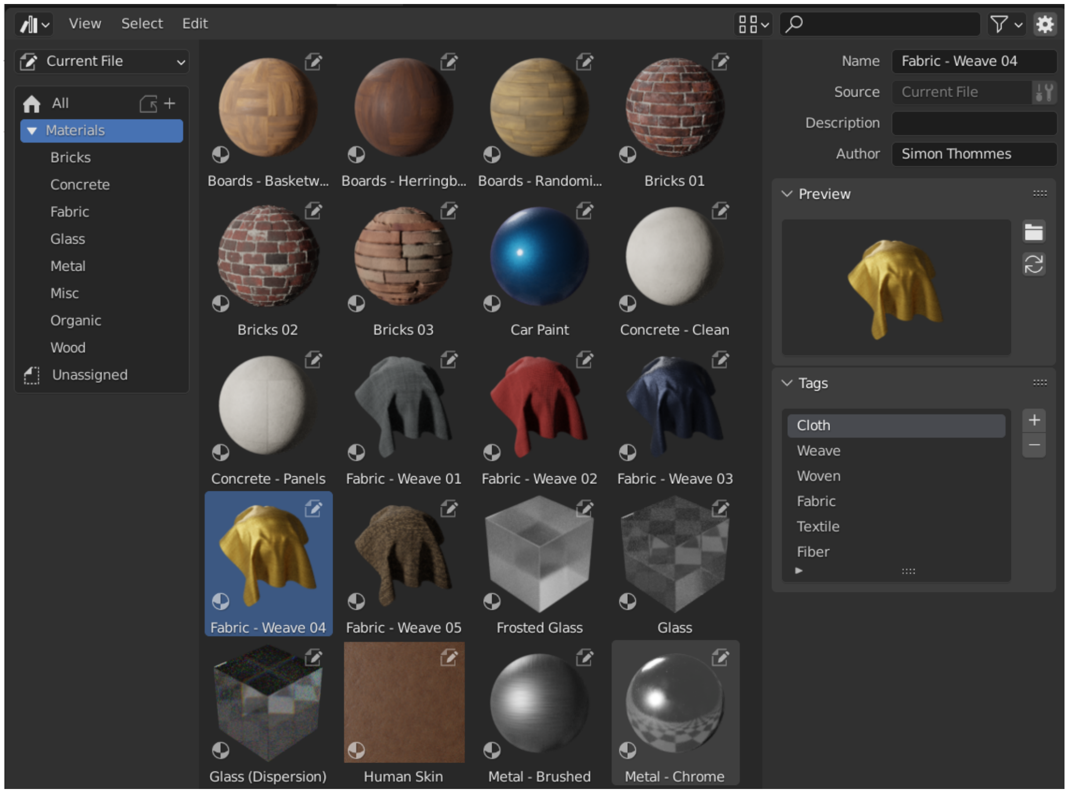
See also

Asset Libraries
For general information on Blender's asset library system, including how to create and edit assets, and design choices.

Asset Catalogs
For organizing assets.

Pose Library
Built on top of the Asset Browser.

Interface


View
Select
Edit
Current File
All
Materials
Bricks
Concrete
Fabric
Glass
Metal
Misc
Organic
Wood
Unassigned
Boards - Basketw...
Boards - Herringb...
Boards - Randomi...
Bricks 01
Bricks 02
Bricks 03
Car Paint
Concrete - Clean
Concrete - Panels
Fabric - Weave 01
Fabric - Weave 02
Fabric - Weave 03
Fabric - Weave 04
Fabric - Weave 05
Frosted Glass
Glass
Glass (Dispersion)
Human Skin
Metal - Brushed
Metal - Chrome
Preview
Tags
Cloth
Weave
Woven
Fabric
Textile
Fiber

Name: Fabric - Weave 04
Source: Current File
Description:
Author: Simon Thommes

Asset Browser, showing materials in an asset library.

Main Region

The center region of the Asset Browser lists the assets contained in the selected catalog.

Click `LMB` to select a single asset. Additionally hold `Ctrl` to add/remove that asset to/from the selection, or `Shift` to select a range of assets. You can also drag `LMB` to perform a box select.

The region has a context menu with the following operations:

Refresh Asset Library `R`
    Refreshes the list.

Clear Asset
    See Removing Assets.

Clear Asset (Set Fake User)
    See Removing Assets.

Open Blend File
    Opens the blend-file containing the asset.

Display Size
    Changes the size of the preview thumbnails.

Asset Library Region

The region on the left lets you select an asset library and shows its catalogs. You can show/hide this region by pressing `T`.

Asset Library
    The asset library whose catalogs to show.

All Libraries::	Show catalogs from all available libraries.
Current File::	Show the catalogs in the current blend-file (even if that file is not yet part of an asset library). See The Current File Asset Library for more information.
Essentials::	Show the catalogs that come bundled with Blender.

Any libraries that you added in the File Path Preferences are listed here too.

Copy Bundle to Asset Library
    Shown when *Asset Library* is set to *Current File* and the current blend-file is an asset bundle that's not yet part of an asset library.

Lets you select a target asset library, then opens a File Browser in that library's root folder so you can save the current blend-file there. Once saved, the assets in the blend-file become available as part of the library.

Catalogs

Tree view that shows the catalogs of the selected asset library. A catalog is a group of assets; when you select one, only the assets in that catalog and its child catalogs will be listed.

You can rename a catalog by double-clicking it, or assign it to a different parent catalog by dragging and dropping.

Add-ons and features like the Pose Library can show custom panels here.

Asset Details Region

The region on the right shows the metadata of the active asset. You can show/hide this region by pressing `N` or clicking the gear icon in the header.

Only metadata of assets contained in the current blend-file can be edited.

Name

The asset's name. Unique for the asset data type within the same blend-file.

Source

The full path of the blend-file that contains the asset.

Open Blend File

Opens the blend-file that contains the asset in a new Blender instance. When this instance is closed, the Asset Browser will be automatically refreshed.

License

Optional name of the license under which this asset is distributed. Not used by Blender itself.

Copyright

Optional copyright notice. Not used by Blender itself.

Description

Optional asset description. Not used by Blender itself.

Author
: Optional field for the asset author. Not used by Blender itself.

Preview

Shows the preview image of the asset. See Asset Previews.

Load Custom Preview
: Opens a File Browser where you can select a new image for the asset preview.

Generate Preview
: Autogenerate a new preview for the asset.

Preview
: Menu of additional preview operators.

  Render Active Object
  : Generates a preview based on the 3D Viewport's Active object. This is useful for node groups, which cannot automatically generate their own preview.

Tags

Panel for viewing and editing asset tags. These do not have any meaning to Blender and can be chosen freely. When using the search field to filter the assets, the assets whose tags (partially) match the search term will also be shown.

> **Note**
>
> Depending on the current mode of the object and the selected asset types, more panels may be shown. For example, see Pose Library.

Using Assets

As a general rule, **an asset can be used by dragging it from the Asset Browser to the desired location**. Objects and worlds can be dragged from the Asset Browser into the scene. Materials can be dragged onto the object that should use them. Geometry nodes can also be dragged onto objects to add a Geometry Nodes Modifier. The use of pose assets is different, and is described in Pose Library.

There are several things that can happen when an asset is used, depending on the following configuration of the Asset Browser:

Import Method

Determines how data is managed when an asset is imported. This option can be found in the center of the Asset Browser header (when an asset library other than *Current File* or *Essentials* is selected):

Follow Preferences

Use the import method set in the File Path Preferences.

Link

Same as File ▸ Link…

The asset will be linked to the current blend-file, and thus be read-only. Later changes to the asset file will be reflected in all files that link it.

Append

Same as File ▸ Append…

The asset and all its dependencies will be copied into the current file. Dragging a material into the scene three times will result in three independent copies. Dragging an object into the scene three times will also result in three independent copies.

“Dependencies” in this case means everything the asset refers to. For an object, this can be its mesh and materials, but also other objects used by modifiers, constraints, or drivers.

Since the file now has its own copy of the asset, later changes to the asset file will not be reflected in the file it's appended to.

Append (Reuse Data)

Specific to the Asset Browser.

The first time an asset is used, it will be appended, including its dependencies, just as described previously. However, Blender will keep track of where it originated, and the next time the asset is used, as much data as possible will be reused. Dragging a material into the scene three times will only load it once, and just assign the same material three times. Dragging an object into the scene three times will create three copies of the object, but all copies will share their mesh data, materials, etc.

Since the file now has its own copy of the asset, later changes to the asset file will not be reflected in the file it's appended to.

Tip

Instancing Collections

Mimics the Instance Collections option when appending from the file browser

Some asset types such as collections can be created as an instanced collection. This is done by enabling the *Instance* option after dragging collection assets into the 3D Viewport. By enabling this option, an empty object is added that uses an instance of the collection. If this option is disabled, the full collection hierarchy will be added to the scene.

Collection Assets from the current file will always be instanced.

Note that all regular Blender operations are available after the asset has been added to the current file. For example, you could choose to link an object to the scene; this will also link its mesh and its materials. Then you can make the object itself local (*Object ‣ Relations ‣ Make Local… ‣*

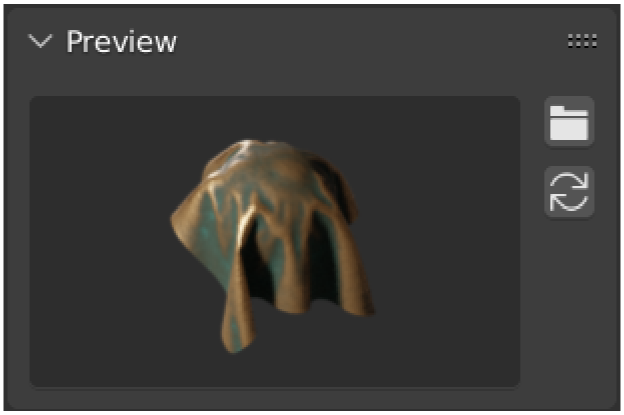
Selected Objects), while keeping the mesh and materials linked to the asset files. This will result in a local, and thus editable, object, and keep the mesh and materials automatically up to date with any changes in the asset library.

Asset Previews

Preview images are typically generated automatically when you mark a data-block as an asset. Objects are captured from their local -Y axis, while collections are captured from the global -Y axis (as these don't have a local axis).

If the auto-generated preview image isn't sufficient, you can replace it by a custom one.

For previews of pose assets, see Controlling the Look of Preview Images.



Preview panel in the Asset Browser.

Asset Bundles

Asset bundles are blend-files that do not reference any other file, and whose name ends in `_bundle.blend`. Any textures and other external files need to be packed into the current blend-file.

Asset bundles can be copied to an asset library via the Asset Browser:

- Open the asset bundle blend-file.
- Switch its Asset Browser to *Current File* (if it's not set to that already).
- Click on *Copy Bundle to Asset Library*.
- Choose the asset library to copy it to.
- A File Browser will open at the root folder of the selected asset library. Choose the desired location of the blend-file, and click the *Copy to Asset Library* button.

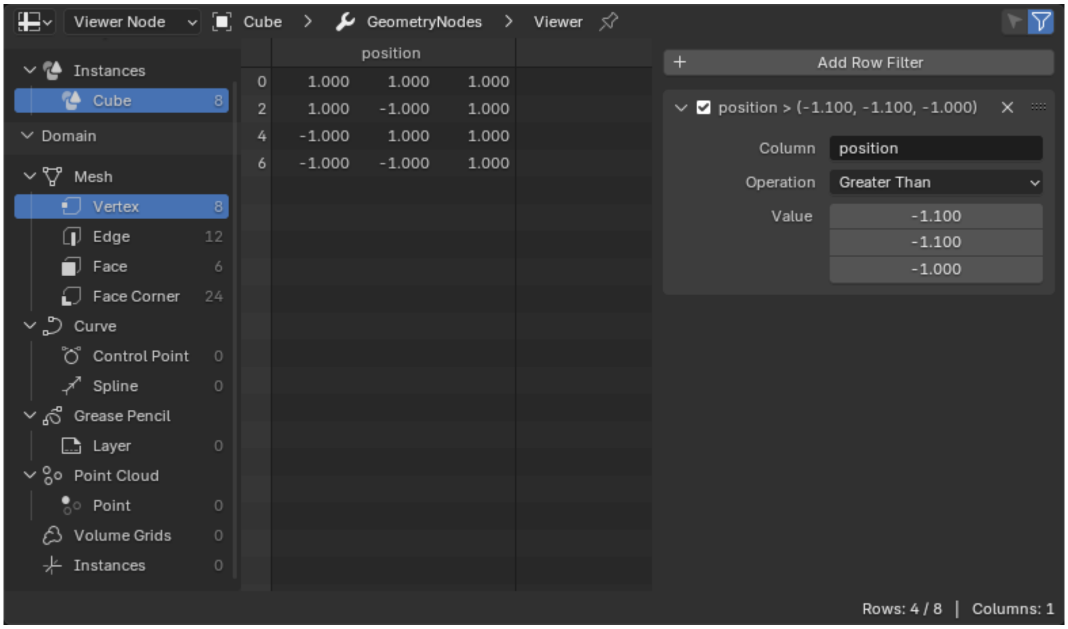
- The blend-file will be saved at the chosen location, and any catalogs of the asset bundle will be merged into the target asset library.

Note

Both the word “asset” and the word “bundle” are commonly used, and not necessarily with the same meaning as described here. Not everything that’s presented as an “asset bundle” will have the *Copy to Asset Library* functionality available; for that, the bundle file needs to adhere to the definition above.

Spreadsheet

The Spreadsheet editor is used to inspect the geometry attributes of the active object, typically in order to debug geometry nodes.


Viewer Node
Cube
GeometryNodes
Viewer
Instances
Cube 8
Domain
Mesh
Vertex 8
Edge 12
Face 6
Face Corner 24
Curve
Control Point 0
Spline 0
Grease Pencil
Layer 0
Point Cloud
Point 0
Volume Grids 0
Instances 0
Add Row Filter

	position		
0	1.000	1.000	1.000
2	1.000	-1.000	1.000
4	-1.000	1.000	1.000
6	-1.000	-1.000	1.000

☑ position > (-1.100, -1.100, -1.000)

Column: position

Operation: Greater Than

Value: -1.100, -1.100, -1.000

Rows: 4 / 8 | Columns: 1

The Spreadsheet editor.

Header

Object Evaluation State

The state for which to display data.

Evaluated::	Display data from the object with all modifiers applied.
Original::	Display data from the original object without any modifiers applied.
Viewer Node::	Display the data that’s fed into the active Viewer Node.

You can also toggle between *Evaluated* and *Viewer Node* by clicking the eye icon in the Viewer node’s header.

Breadcrumbs

Shows the name of the active object, and (if *Object Evaluation State* is set to *Viewer Node*) the name of the Geometry Nodes modifier and the active Viewer node.

You can click one of the arrows between the names to hide the modifier.

Toggle Pin

Click to “lock” the editor to the currently active object, and have it keep displaying that object’s data even if another object becomes active. Click again to unlock.

Selected Only

This option is only available if the object is in Edit Mode. When checked, only data for the selected geometry elements is shown.

Use Filter

Whether to use the filters that are defined in the Sidebar (see below).

Main Region

The main view shows the actual spreadsheet. Column names and row indices remain visible when scrolling down or to the side.

Note

Tooltips give more detail about the value, depending on the type. For example, *Byte Color* attributes are displayed as scene linear floats, but the actual integer values are displayed when hovering over the float values, and *Matrix* attribute values are only displayed in tooltips.

Data Set Region

With region on the left, you can choose what to display data for. The top tree lets you pick from the hierarchy of geometries, such as a mesh inside an instance. The bottom tree lets you pick a domain, such as mesh vertices or curve splines.

Each tree item shows the number of elements inside.

Sidebar

In the Sidebar, you can define filters so that only the rows matching these filters are displayed. Click *Add Row Filter* and set up the properties described below.

Enabled

Uncheck to temporarily disable the filter.

Column

The name of the column to filter on. If there is no column with the specified name, the filter will be grayed out and ignored.

If you want to filter on an attribute from another domain, you can use the Store Named Attribute Node to create a copy that's converted to the current domain, then filter on that.

Operation

For numerical columns, you can select one of the following comparison operators. Other columns only support *Equal To*.

Equal To::	Only display rows whose value for the column is equal to the filter value (within the specified threshold).
Greater Than::	Only display rows whose value for the column is greater than the filter value.
Less Than::	Only display rows whose value for the column is less than the filter value.

Value

The filter value to compare the row value to.

Threshold

How much the row’s value is allowed to deviate from the filter value before it is excluded.

Status Bar

The status bar shows how many rows and columns there are, and how many rows remain after filtering.

Preferences

- Introduction
    - Managing Preferences

Sections

- Interface
- Viewport
- Lights
- Editing
- Animation

- Get Extensions

- Add-ons
- Themes

- Input
- Navigation
- Keymap

- System
- Save & Load
- File Paths

- Experimental

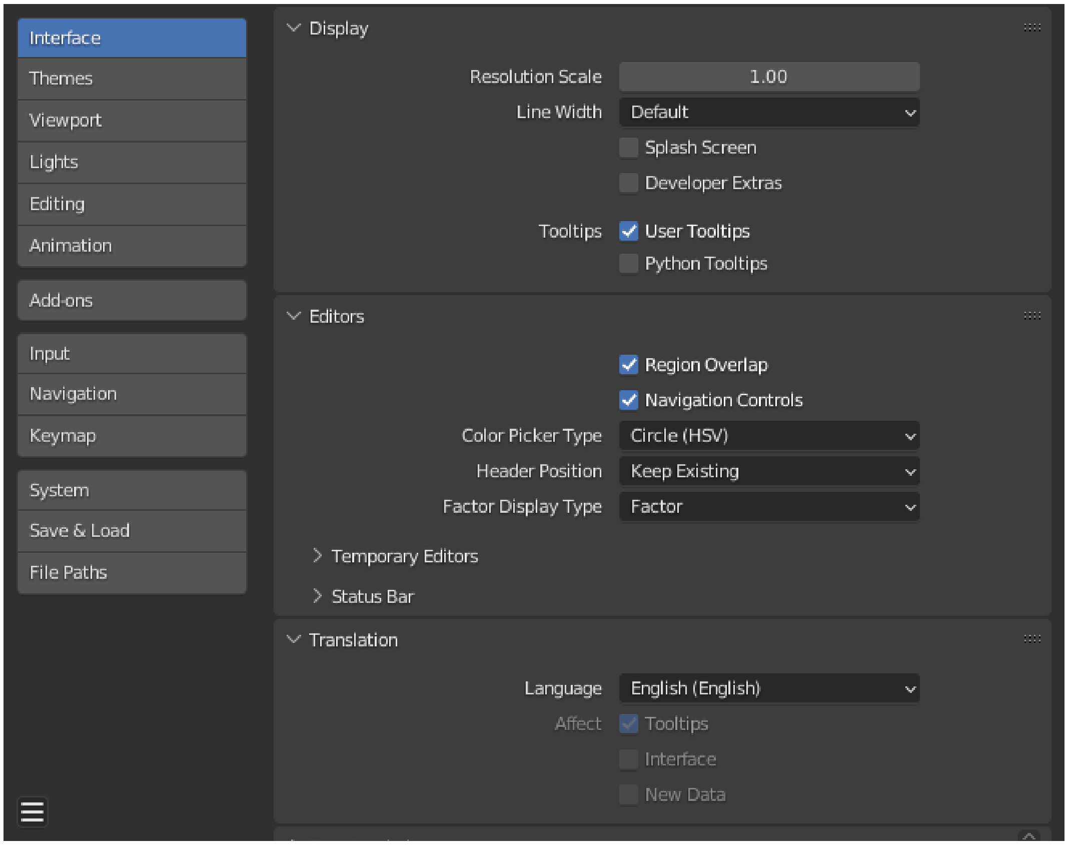
Introduction

Reference

Menu:: *Edit ‣ Preferences…*
Shortcut:: `Ctrl-Comma`

This chapter explains how to change Blender's default configuration with the *Preferences* editor.

The Blender *Preferences* contains settings to control how Blender behaves. At the left of the editor, the available options are grouped into sections.


Interface
Themes
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System
Save & Load
File Paths
Display
Editors
Temporary Editors
Status Bar
Translation

Resolution Scale 1.00
Line Width Default
☐ Splash Screen
☐ Developer Extras
Tooltips ☑ User Tooltips
☐ Python Tooltips

☑ Region Overlap
☑ Navigation Controls
Color Picker Type Circle (HSV)
Header Position Keep Existing
Factor Display Type Factor

Language English (English)
Affect ☑ Tooltips
☐ Interface
☐ New Data

Blender Preferences window.

Managing Preferences

Default preferences are managed from the ≡ menu in the preferences window.

The following items are available in this menu:

Auto-Save Preferences

By default changes to preferences are saved on exit, this allows changes to the keymap and Quick Favorites menu to be stored and used between Blender Sessions.

When disabled, a *Save Preferences* button is shown to manually perform the operation.

Revert to Saved Preferences

Undoes any unsaved modifications, loading the previously saved state.

Load Factory Preferences

Completely undo all the modifications made to the preferences, resetting to the state used before making customizations.

Note

After running *Load Factory Preferences*, auto-save will be disabled for the current session.

This allows you to switch back to the factory settings for testing or following tutorials for example, without the risk of accidentally auto-saving over the preferences you have manually configured.

If you wish to save these as your preferences, run *Save Preferences* manually.

Note

This only resets the preferences and will not affect settings stored in the startup file. This includes app templates, area locations, and any

Blender properties not part of the preferences.

These must be reverted though *File* ‣ *Defaults*.

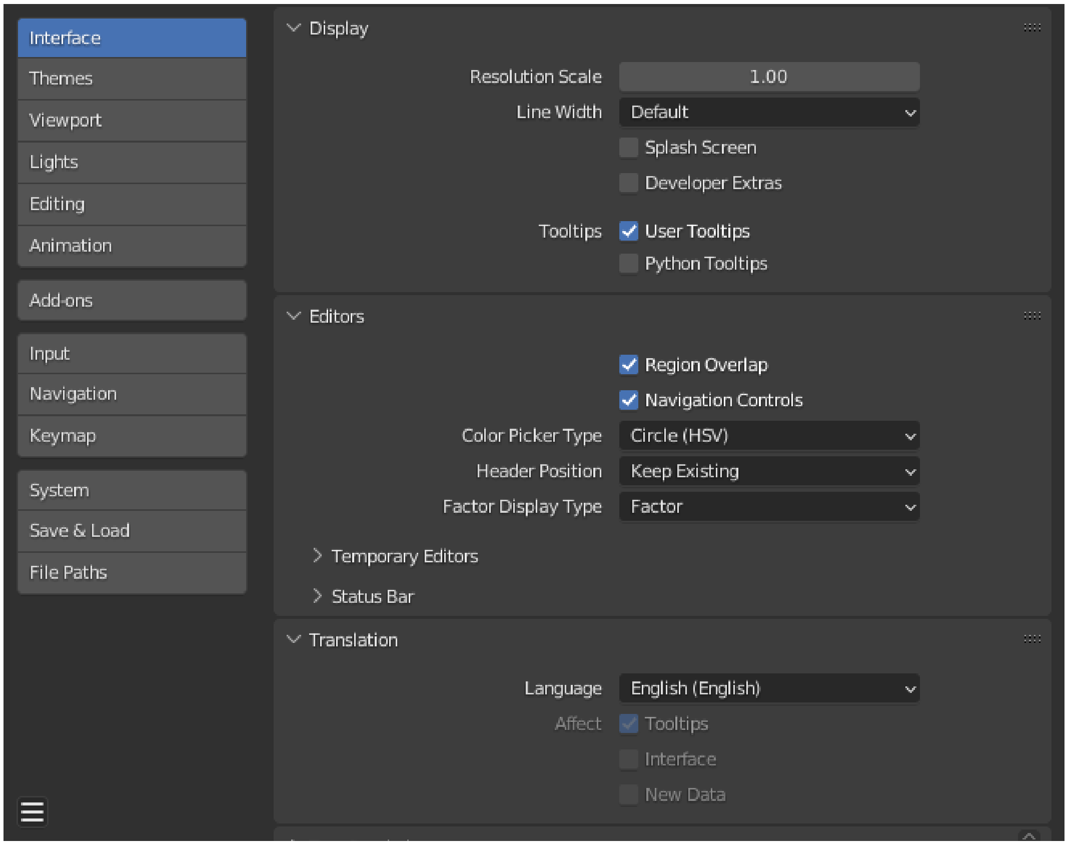
Tip

It can be valuable to make a backup of your preferences in the event that you lose your configuration.

See the directory layout section to see where your preferences are stored.

Interface

Interface configuration lets you change how UI elements are displayed and how they react.


Interface
Themes
Viewport
Lights
Editing
Animation
Add-ons
Input
Navigation
Keymap
System
Save & Load
File Paths
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Editors
Temporary Editors
Status Bar
Translation

Resolution Scale 1.00
Line Width Default
☐ Splash Screen
☐ Developer Extras
Tooltips ☑ User Tooltips
☐ Python Tooltips

☑ Region Overlap
☑ Navigation Controls
Color Picker Type Circle (HSV)
Header Position Keep Existing
Factor Display Type Factor

Language English (English)
Affect ☑ Tooltips
☐ Interface
☐ New Data

Display

Resolution Scale

Adjusts the size of fonts and buttons relative to the automatically detected DPI. During typical usage, you may prefer to use zoom which is available in many parts of Blender interface.

Line Width

Scale of lines and points in the interface e.g. button outlines, edges and vertex points in the 3D Viewport.

Thin, Default, Thick

Splash Screen

Display the Splash Screen when starting Blender.

Developer Extras

Show settings and menu items which are intended to help developers, this includes:

- Operator Search
- Sequencer Cache Settings

Button Context Menu

Online Python Reference

To open the Python reference manual.

Copy Python Command

To copy the expression used when pressing the button.

Edit Source

To edit Python source code that defines the button.

Edit Translation

The option to edit UI translations (only available when the *Manage UI translations* add-on is also enabled).

3D Viewport

Show Indices

The option to show mesh vertex/edge/face indices in the overlay popover.

Preferences

Experimental Tab

Work in progress features can be enabled here which are currently being tested.

Tooltips

User Tooltips

When enabled, a tooltip will appear when your mouse pointer is over a control. This tip explains the function of what is under the pointer, shows the associated hotkey (if any).

Python Tooltips

Displays a property's Python information below the tooltip.

Search – Sort by Most Recent

Show most recently selected items at the top of search results, otherwise search results are sorted alphabetically.

Editors

Region Overlap

This makes regions overlap the viewport. It means that the *Toolbar* and *Sidebar* regions, will be displayed overlapping the main area.

Navigation Controls

Show navigation controls at top right of the area. This impacts the 3D Viewport as well as image spaces.

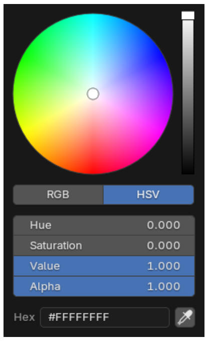
Note

If you are familiar with navigation key shortcuts, this can be disabled.

Color Picker Type

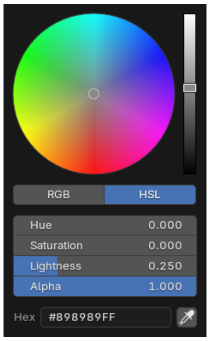
Choose which type of Color Space you prefer for the Color picker. It will show when clicking `LMB` on any color field.

Color Picker types.



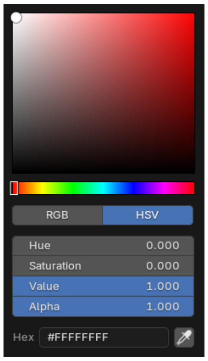
Hue 0.000
Saturation 0.000
Value 1.000
Alpha 1.000
Hex #FFFFFFFF

Circle HSV.



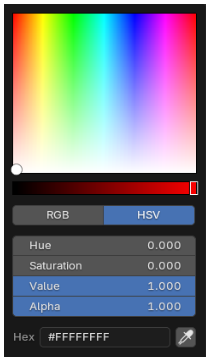
Hue 0.000
Saturation 0.000
Lightness 0.250
Alpha 1.000
Hex #898989FF

Circle HSL.



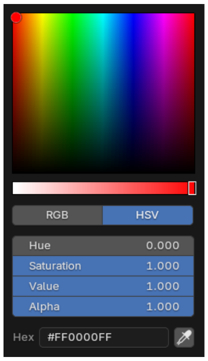
Hue 0.000
Saturation 0.000
Value 1.000
Alpha 1.000
Hex #FFFFFFFF

Square (SV + H).



Hue 0.000
Saturation 0.000
Value 1.000
Alpha 1.000
Hex #FFFFFFFF

Square (HS + V).



Hue 0.000
Saturation 1.000
Value 1.000
Alpha 1.000
Hex #FF0000FF

Square (HV + S).

Header Position

The default header position when opening a new editor.

Keep Existing::	Uses top for most editor types and the positions saved in the start-up file.
Top/Bottom::	Always positions the header at the top or the bottom of the editor.

Factor Display Type

How factor value types are displayed in the user interface.

Factor::	Values are displayed as float numbers between 0.0 and 1.0.
Percentage::	Values are expressed as a percentage between 0 and 100.

Temporary Editors

When performing certain operations, Blender will open a new window. The behavior of these operations can be configured here.

Render In

When rendering, the user interface can do any of:

Keep User Interface::	The user interface does not change and the render is computed in the background.
Maximize Area::	A new Image editor is opened as a temporary window in full screen mode.
Image Editor::	The area that is the largest on screen is replaced placed by a temporary Image editor.
New Window::	A new Image editor is opened as a regularly sized temporary window.

File Browser

When opening files from the computer, the user interface can do any of:

Maximize Area::	A new File Browser editor is opened as a temporary window in full screen mode.
New Window::	A new File Browser editor is opened as a regularly sized temporary window.

Status Bar

Preferences that affect the Status Bar.

Show

Scene Statistics

Shows information about the data in the active scene.

- **Collection**: The name of the active Collection.
- **Active Object**: The name of the active selected object.

- **Geometry**: Information about the current scene depending on the mode and object type. This can be the number of vertices, faces, triangles, or bones.
- **Objects**: The number of selected objects and the total count of objects.

Scene Duration

Shows the total amount of time of the playback along with the current frame number and total frame count. The format of the duration text is determined by the Timecode Style.

System Memory

Shows an estimate of Blender's RAM consumption. On a single-instance single-machine scenario, this estimate provides a measurement against the hardware limit of the machine.

Extensions Updates

Shows the number of extensions with available updates.

Blender Version

Shows the version number of Blender that is currently running.

Language

Language

The language used for translating the user interface (UI). The list is broken up into categories determining how complete the translations are.

Translate

Tooltips

Translates the descriptions when hovering over UI elements.

Interface

Translates all labels in menus, buttons, and panels.

New Data

Translates the names of new data-blocks.

Text Rendering

Anti-Aliasing
: Enable interface text Anti-Aliasing. When disabled, texts are rendered using straight text rendering (filling only absolute pixels).

Subpixel Anti-Aliasing
: Render text for optimal horizontal placement.

Hinting
: Adjust font hinting, controls the spacing and crispness of text display.

Interface Font
: Replacement for the default user interface font.

Mono-space Font
: Replacement for the default mono-space interface font *(used in the Text editor and Python Console)*.

Menus

Open on Mouse Over

Select this to have the menu open by placing the mouse pointer over the entry instead of clicking on it.

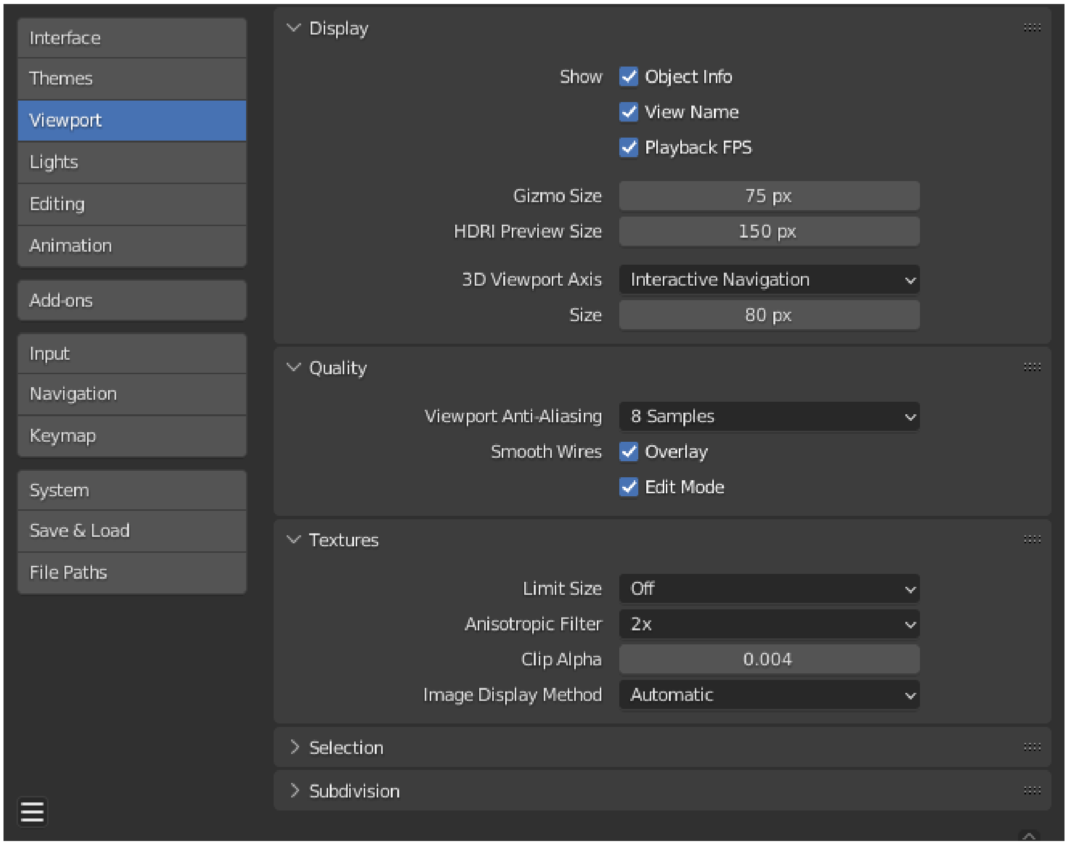
Top Level
: Time delay in 1/10 second before a menu opens (*Open on Mouse Over* needs to be enabled).

Sub Level
: Same as above for sub menus (for example: *File* ‣ *Open Recent*).

Pie Menus

Animation Timeout

Viewport


Interface
Themes
Viewport
Lights
Editing
Animation
Add-ons
Input
Navigation
Keymap
System
Save & Load
File Paths

Display

Show ☑ Object Info
☑ View Name
☑ Playback FPS
Gizmo Size 75 px
HDRI Preview Size 150 px
3D Viewport Axis Interactive Navigation
Size 80 px

Quality

Viewport Anti-Aliasing 8 Samples
Smooth Wires ☑ Overlay
☑ Edit Mode

Textures

Limit Size Off
Anisotropic Filter 2x
Clip Alpha 0.004
Image Display Method Automatic

Selection

Subdivision

Blender Preferences Viewport section.

Display

Text Info Overlay

Object Info

Display the active Object name and frame number at the top left of the 3D Viewport.

View Name

Display the name and type of the current view in the top left corner of the 3D Viewport. For example: “User Perspective” or “Top Orthographic”.

Playback Frame Rate (FPS)

Show the frames per second screen refresh rate while an animation is played back. It appears in the top left of the 3D Viewport, displaying red if the frame rate set cannot be reached.

Frame Rate Samples

Calculate the FPS displayed in the viewport based on an average of the current and previously displayed frames. A value of zero uses the number of frames in 1.0 second.

- More samples represent the average FPS over a longer period of time, however sudden changes to performance result in a more gradual increase/decrease over time.
- Fewer samples shows an FPS which more closely matches the actual performance, however the value may jitter - making the FPS difficult to comprehend.

Gizmo Size

Diameter of the gizmo.

HDRI Preview Size

Diameter of the HDRI sphere overlay.

3D Viewport Axes

Interactive Navigation::	Display the axis as an interactive gizmo. Click sets the viewport to display along this axis and dragging orbits the view.
Simple Axes::	Display simple, less intrusive axis in the viewport. Brightness How vivid the colors of the simple axis are.
Off::	Disables the viewport axis.

Size

Diameter of the *3D Viewport Axis* widget.

Fresnel – Edit Mode

Enable a fresnel effect on edit mesh overlays. It improves shape readability of very dense meshes, but increases eye fatigue when modeling lower poly.

Quality

Viewport Anti-Aliasing

Control the Anti-Aliasing for higher quality rendering.

Smooth Wires

Overlay

Display overlays with smooth wire, without this wires will be rendered aliased. To increase the visibility you can disable this for Edit Mode specificity (see below), since edges do not blend into other shaded regions.

Edit Mode

Display smooth wire in Edit Mode, without this wires will be rendered aliased.

Textures

Limit Size

Limit the maximum resolution for pictures used in textured display to save memory. The limit options are specified in a square of pixels (e.g: the option 256 means a texture of 256×256 pixels). This is useful for game engineers, whereas the texture limit matches paging blocks of the textures in the target graphic card memory.

Anisotropic Filtering

Sets the level of anisotropic filtering. This improves the quality of textures that are rendered at the cost of performance.

Clip Alpha

Clip alpha below this threshold in the 3D Viewport. Note that, the default is set to a low value to prevent issues on some GPUs.

Image Display Method

Method to render images; the following options are supported:

Automatic::	Automatically use *GLSL* which runs on the GPU for performance but falls back to the CPU for large images which might be slow when loaded with the GPU.
2D Texture::	Uses CPU for display transform and render images as a 2D texture.
GLSL::	Fastest method using GLSL for display transform and render images as a 2D texture.

Selection

GPU Depth Picking

This option uses an alternative method of picking which uses depth information to select the front-most elements. It is only used for selecting with the cursor (not box select, lasso, circle select, etc.).

Performance varies depending on your OpenGL hardware and drivers.

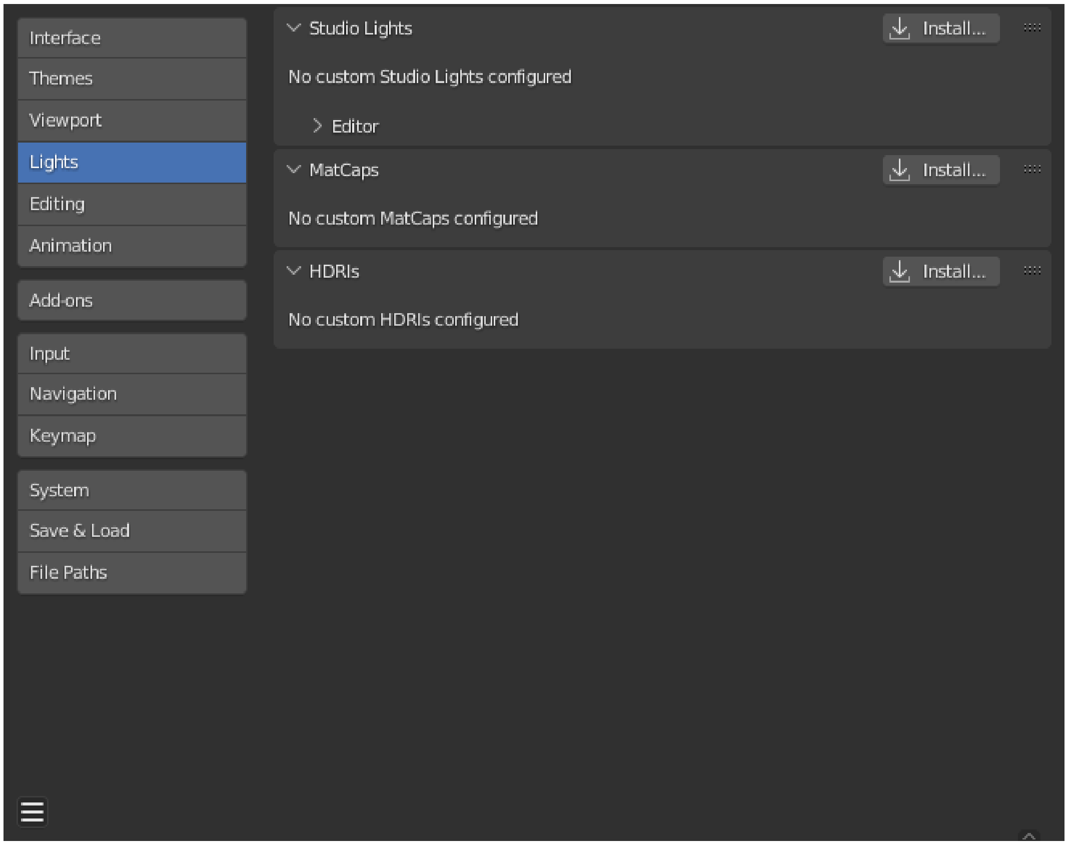
Subdivision

GPU Subdivision

Under certain circumstances, the GPU will be used to subdivide a mesh with a Subdivision Surface modifier. This typically results in increased subdivision performance.

This feature is not supported on Qualcomm GPUs on Windows

Lights


Interface
Themes
Viewport
Lights
Editing
Animation
Add-ons
Input
Navigation
Keymap
System
Save & Load
File Paths
Studio Lights
Install...
Editor
MatCaps
Install...
HDRIs
Install...

No custom Studio Lights configured

No custom MatCaps configured

No custom HDRIs configured

Blender Preferences Lights section.

Studio Lights

Studio Lights are used to illuminate the 3D Viewport during *Solid View* and will not be rendered. Unlike lights in the scene, the lighting direction follows the viewport orientation.

Editor

There are up to four virtual light sources.

The Light toggles allow you to enable or disable individual lights. At least one of the four lights must remain enabled for the 3D Viewport. The lights are equal, except for their direction and color. You can control the direction of the lights, as well as their diffuse and specular colors.

Use Light
    Toggles the specific light.

Diffuse
    This is the constant color of the light.

Specular
    This is the highlight color of the light.

Smooth
    Smooth the shading from this light.

    This has the effect of lighting to be less direct.

Direction
    The direction of the light, (see Direction Buttons).

    The direction of the light will be the same as shown at the sphere surface.

Ambient Color
    The color of unlit areas.

MatCaps

This panel manages MatCap image files which can used to light the view when MatCap shading is enabled.

Two kinds of images are supported for MatCaps. Regular image files and multilayered OpenEXR files. When using multilayered OpenEXR files, the layer named “diffuse” will be used as a diffuse pass, the layer named “specular” will be used as a specular pass. Regular images will be handled as “diffuse” and will not support specular highlighting.

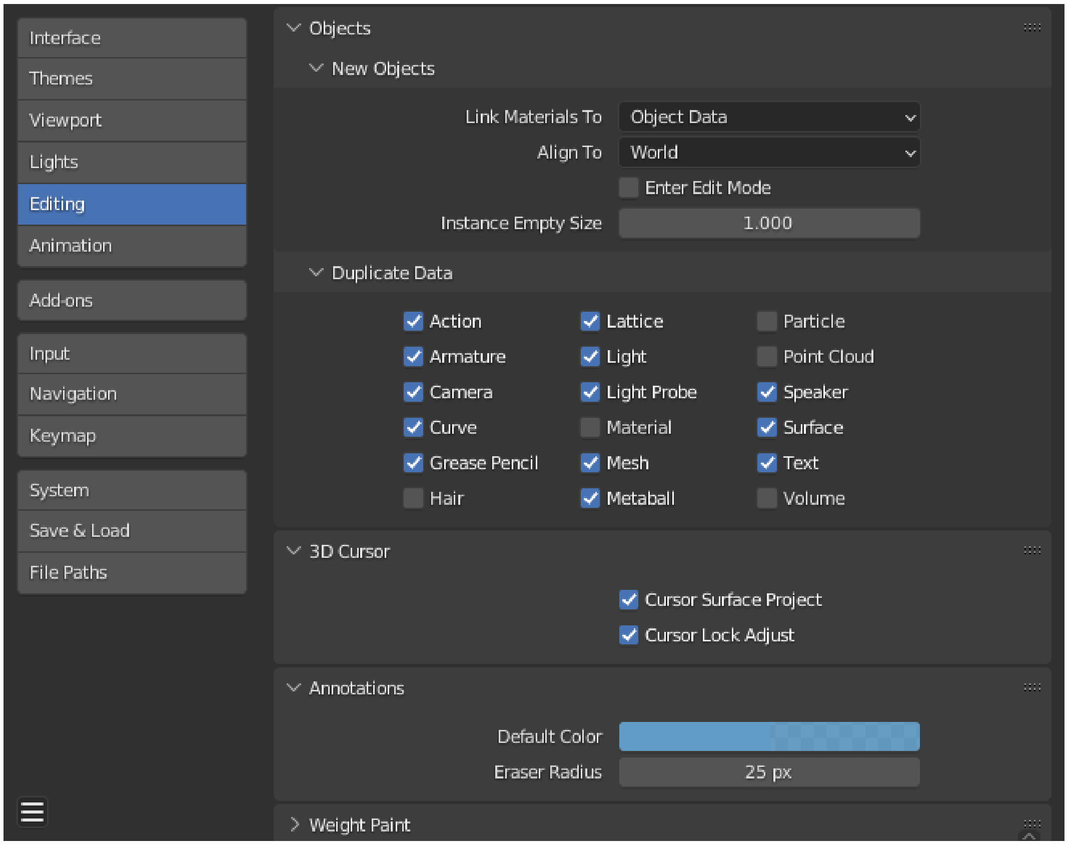
The diffuse pass is multiplied with the base color of the objects and the specular pass is added on top. MatCaps, that only have a diffuse pass tend to look very metallic, with a separate specular pass it is possible to simulate a wider variety of materials.

HDRIs

This panel manages HDRI image files which can be used to light the view when Material Preview or Rendered shading is enabled.

Editing

These preferences control how several tools will interact with your input.


Interface
Themes
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Lights
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Animation
Add-ons
Input
Navigation
Keymap
System
Save & Load
File Paths

Objects

New Objects

Link Materials To: Object Data

Align To: World

☐ Enter Edit Mode

Instance Empty Size: 1.000

Duplicate Data

- ☑ Action
- ☑ Armature
- ☑ Camera
- ☑ Curve
- ☑ Grease Pencil
- ☐ Hair
- ☑ Lattice
- ☑ Light
- ☑ Light Probe
- ☐ Material
- ☑ Mesh
- ☑ Metaball
- ☐ Particle
- ☐ Point Cloud
- ☑ Speaker
- ☑ Surface
- ☑ Text
- ☐ Volume

3D Cursor

- ☑ Cursor Surface Project
- ☑ Cursor Lock Adjust

Annotations

Default Color

Eraser Radius: 25 px

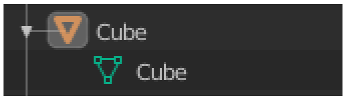
Weight Paint

Objects

New Objects

Link Materials To

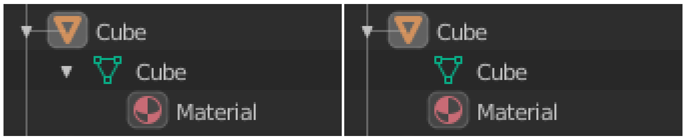
To understand this option properly, you need to understand how Blender works with Objects. Almost everything in Blender is organized in a hierarchy of data-blocks. A data-block can be thought of as containers for certain pieces of information. For example, the Object data-block contains information about the Object's location, rotation, and scale while the associated linked Object Data data-block contains information about the mesh.



Example for a mesh.

A material may be linked in two different ways:

Object Data::	Any created material will be created as part of the Object Data data-block.
Object::	Any created material will be created as part of the Object data-block.



A material linked to Object Data (left) and Object (right).

See also

Read more about Blender's Data System.

Align to

World::	New objects align with world coordinates.
View::	New object align with view coordinates.
3D Cursor::	New objects align to the 3D cursor's orientation.

Enter Edit Mode

If selected, Edit Mode is automatically activated when you create a new object.

Instance Empty Size

The display size for empties when a new collection instance is created.

Copy on Duplicate

The checkboxes define what data is copied with a duplicated object and what data remains linked. Any boxes that are checked will have their data copied along with the duplication of the object. Any boxes that are not checked will instead have their data linked from the source object that was duplicated.

For example, if you have *Mesh* checked, then a full copy of the mesh data is created with the new object, and each mesh will behave independently of the duplicate. If you leave the mesh box unchecked then when you change the mesh of one object, the change will be mirrored in the duplicate object.

The same rules apply to each of the checkboxes in the data-block list.

3D Cursor

Cursor – Surface Project
  When placing the cursor by clicking, the cursor is projected onto the surface under the cursor.

Cursor – Lock Adjust
  When the viewport is locked to the cursor, moving the cursor avoids the view *jumping* based on the new offset.

Annotations

Default Color
  The default color for new Annotate layers.

Eraser Radius
  The size of the eraser used with the Annotate Tool.

See also

Read more about Annotations.

Weight Paint

Mesh skin weighting is used to control how much a bone deforms the mesh of a character. To visualize and paint these weights, Blender uses a color ramp (from blue to green, and from yellow to red). Enabling the checkbox will enable an alternate map using a ramp starting with an empty range. Now you can create your custom map using the common color ramp options. For detailed information see the Color ramps page.

Grease Pencil

Manhattan

The minimum number of pixels the mouse should have moved either horizontally or vertically before the movement is recorded. Decreasing this should work better for curvy lines.

Euclidean

The minimum distance that mouse has to travel before movement is recorded.

See also

Read more about Grease Pencil.

Text Editor

Auto Close Character Pairs

Automatically insert the corresponding character to close an expression when typing characters such as quotes, brackets, braces, or parentheses.

Node Editor

Auto-Offset

Automatically offset the following or previous nodes in a chain when inserting a new node. See Auto-Offset for more information.

Auto-offset Margin

Margin to use for offsetting nodes.

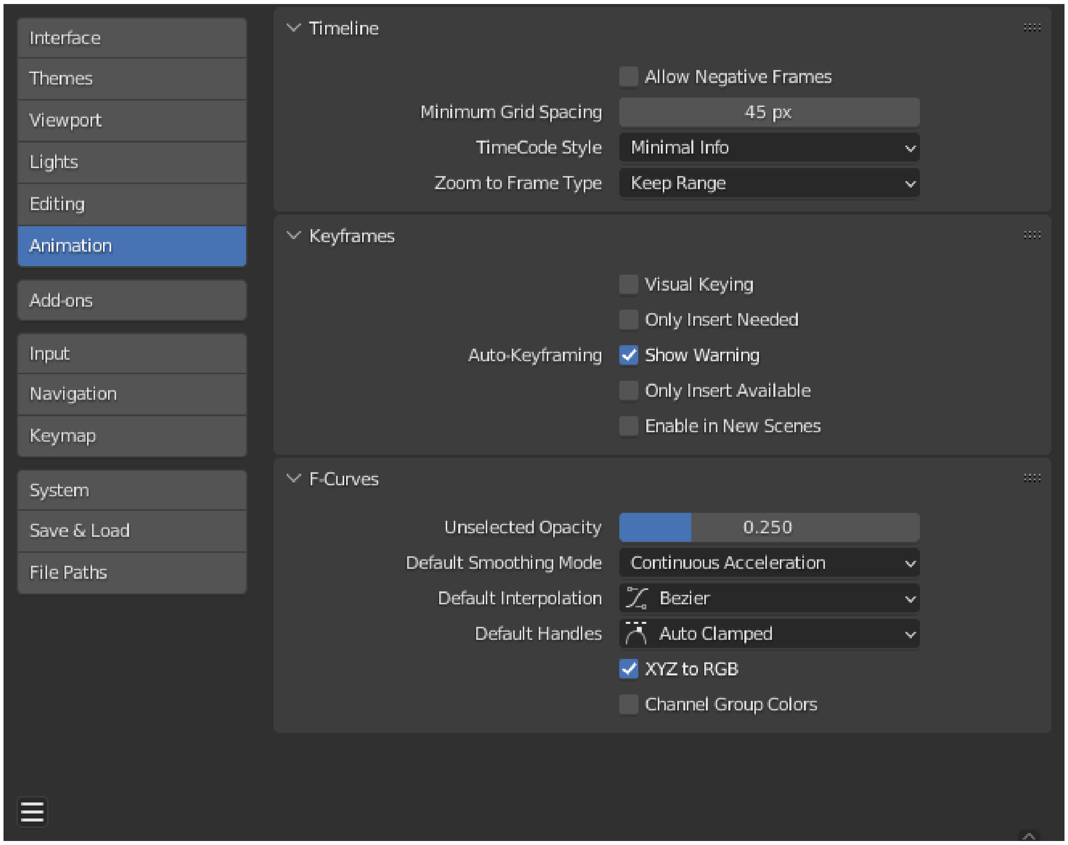
Miscellaneous

Sculpt Overlay Color

Defines a color to be used in the inner part of the brushes circle when in Sculpt Mode, and it is placed as an overlay to the brush, representing the focal point of the brush influence. The overlay color is visible only when the overlay visibility is selected (clicking at the *eye* to set its visibility), and the transparency of the overlay is controlled by the alpha slider located at the *Tool tab* ▸ *Display panel* in the Sidebar.

Animation

The *Animation* section lets you manage settings related to Animation. This includes how editors look and also some different tools properties.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Timeline

☐ Allow Negative Frames
Minimum Grid Spacing: 45 px
TimeCode Style: Minimal Info
Zoom to Frame Type: Keep Range

Keyframes

☐ Visual Keying
☐ Only Insert Needed
Auto-Keyframing: ☑ Show Warning
☐ Only Insert Available
☐ Enable in New Scenes

F-Curves

Unselected Opacity: 0.250
Default Smoothing Mode: Continuous Acceleration
Default Interpolation: Bezier
Default Handles: Auto Clamped
☑ XYZ to RGB
☐ Channel Group Colors

Blender Preferences Animation section.

Timeline

These settings control things in the Timeline.

Allow Negative Frame
: Playback and animations can occur during negative frame ranges.

Minimum Grid Spacing

The minimum number of pixels between grid lines.

Timecode Style

Format of timecodes displayed when not displaying timing in terms of frames.

Minimal Info::	Most compact representation, uses '+' as separator for sub-second frame numbers, with left and right truncation of the timecode as necessary.
SMPTE (Full)::	Full SMPTE timecode (format is HH:MM:SS:FF).
SMPTE (Compact)::	SMPTE timecode showing minutes, seconds, and frames only – hours are also shown if necessary, but not by default.
Compact with Decimals::	Similar to SMPTE (Compact), except that the decimal part of the second is shown instead of frames.
Only Seconds::	Direct conversion of frame numbers to seconds.

Zoom to Frame Type

Defines what time range (around the cursor) will be displayed when the *View Frame* `Numpad0` is performed.

Keep Range::	The currently displayed time range is preserved.
Seconds::	The number of seconds specified in the *Zoom Seconds* field will be shown around the cursor.
Keyframes::	The number of animation keyframes defined in the *Zoom Keyframes* field will be shown around the cursor.

Keyframes

These settings control Keyframes which are the building blocks for animations.

Default Key Channels

Which channels to insert keys at when no keying set is active.

Location::	Inset keyframes for an object's Location.
Rotation::	Inset keyframes for an object's Rotation.
Scale::	Inset keyframes for an object's Scale.
Rotation Mode::	Inset keyframes for an object's Rotation Mode.
Custom Properties::	Inset keyframes for Custom Properties.

Only Insert Needed

This will only insert keyframes if the value of the property is different.

Manual::	When keying manually, skip inserting keys that don't affect the animation.
Auto::	Auto-Keying will skip inserting keys that don't affect the animation.

Keyframing – Visual Keying

When an object is using constraints, the object property value does not actually change. *Visual Keying* will add keyframes to the object property, with a value based on the visual transformation from the constraint.

Auto-Keyframing

Enable in New Scenes

Enables *Auto Keyframe* by default for new scenes.

Show Warning

Displays a warning at the top right of the *3D Viewport*, when moving objects, if *Auto Keyframe* is on.

Only Insert Available

This will only add keyframes to channels of F-Curves that already exist.

See also

Learn more about Auto-Keyframing.

F-Curves

These settings control how F-Curves look and their default behavior.

Unselected Opacity
: Controls the opacity of unselected F-Curves against the background of the Graph Editor.

Default Smoothing Mode
: Controls the behavior of automatic curve handles for newly created F-Curves.

Default Interpolation
: Controls the default Interpolation for newly created keyframes.

Default Handles
: Controls the default Handle for newly created F-Curves.

XYZ to RGB
: Color for X, Y, or Z animation curves (location, scale or rotation) is the same as the color for the X, Y, and Z axis.

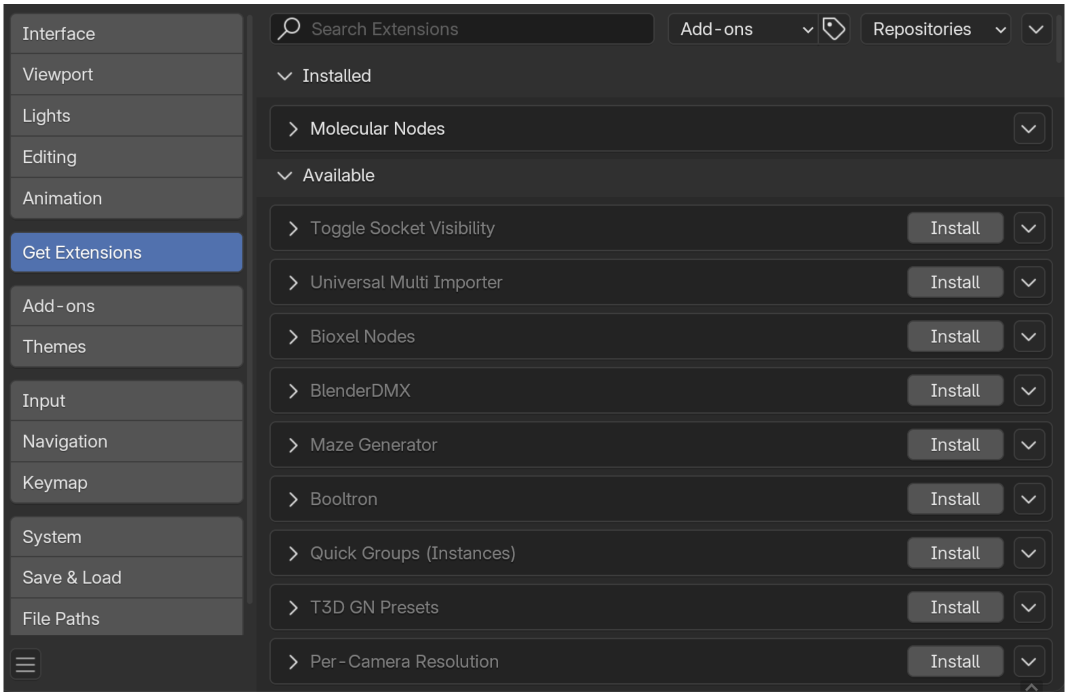
Channel Group Colors
: Display groups and channels with colors matching their corresponding groups.

Only Show Selected F-Curve Keyframes
: Only shows the keyframes markers on the selected curves.

Use High Quality Display
: Display F-Curves using Anti-Aliasing and other effects (disable for a better performance).

Get Extensions

The *Get Extensions* section lets you install and manage extensions preferences.


Interface
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Get Extensions
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Search Extensions
Add-ons
Repositories
Installed
Molecular Nodes
Available
Toggle Socket Visibility
Universal Multi Importer
Bioxel Nodes
BlenderDMX
Maze Generator
Booltron
Quick Groups (Instances)
T3D GN Presets
Per-Camera Resolution
Install

Blender Preferences Extensions section.

See also

To learn about extensions and how to create them, refer to the Extensions page.

Installing Extensions

There are different ways to install an extension:

Install from the Website

Drag the installation URL into Blender.

Install from Blender
Search for the extension name and click on Install.

Install from Disk
Use the drop-down menu in the top right, or drag-and-drop an extension `.zip` package into Blender.

Note

Any installed extension can be removed. This is a permanent change, though. To stop an extension temporarily, it is better to Disable it instead.

Updating Extensions

You need to manually check for available updates. Once an update is found, Blender will let you update any of the available extensions.

The current available version of an extension on the repository will always be considered the latest version.

Enable/Disable

Once an extension is installed it can be disabled (or re-enabled) as part of the user preferences. Some extension types do not support this, and will always be shown as enabled.

Tip

If the Add-on does not activate when enabled, check the Console window for any errors that may have occurred.

Extension Settings

Visit Extensions Platform

Opens *extensions.blender.org <https://extensions.blender.org/>* in a web browser.

Refresh Remote

Manually check the online repositories for available updates.

Refresh Local

Scan extension & legacy add-ons for changes to modules & meta-data (similar to restarting). Any issues are reported as warnings

Install Available Updates

Update all the extensions that have an update available.

Install from Disk

Install an extension from a `.zip` package. This is installed to a Local Repository and no updates will be available.

This can also be used to install legacy Add-ons, for more information see: Installing Legacy Add-ons.

Filter by Type

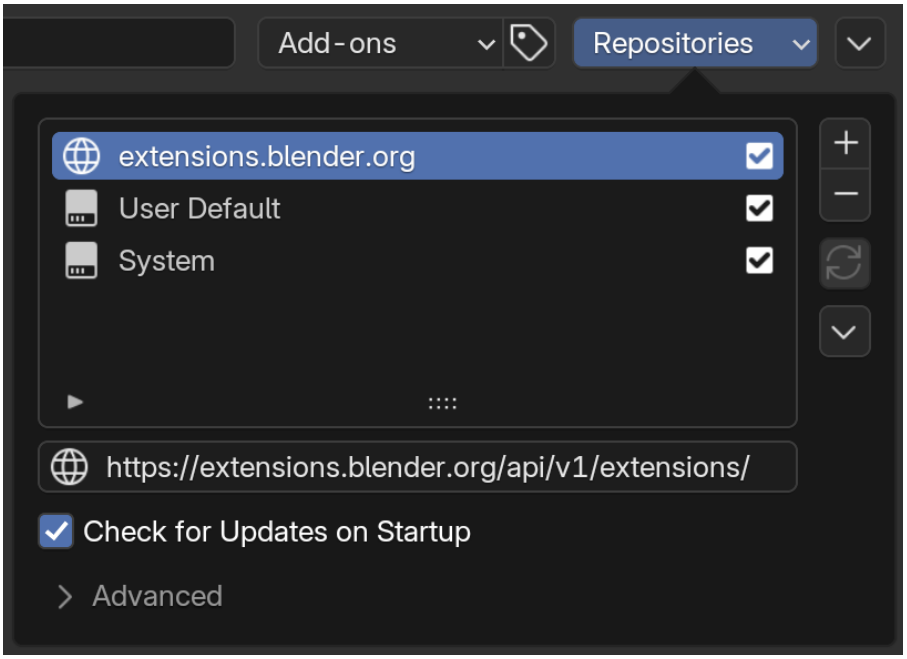
Or show only extensions of a single type:

Add-ons::	Only show add-ons.
Themes::	Only show themes.

Repositories

By default Blender has a Remote Repository pointing towards the Official Blender Extensions Platform and two Local Repositories.

In the cases where more repositories are needed (e.g., to access third party extension platforms), new repositories can be added.



extensions.blender.org ☑

User Default ☑

System ☑

https://extensions.blender.org/api/v1/extensions/

☑ Check for Updates on Startup

Repositories.

To add new repositories click on the + icon:

Add Remote Repository
  Add a repository from a URL.

Add Local Repository
  Add a repository which will be managed by the user (to be used with Install from Disk).

To remove repositories click on the - icon:

Remove Repository
  Remove an extension repository.

Remove Repository & Files
  Remove a repository and delete all associated files when removing.

These changes are permanent and cannot be reversed.

Remote Repository

Remote repository with support for listing and updating extensions.

Options:

Check for Updates on Startup
: Allows Blender to check for updates upon launch. When updates are available a notification will be visible on the status bar.

Access Token
: Personal access token, may be required by some repositories.

Local Repository

A repository managed manually by the users.

There are two types of local repositories. By default new local repositories are added as User repositories. This is what you want most of the time.

After creating a repository they can be changed in the Advanced options to have a source System. These repositories are intended to bundle extensions with Blender, to make it portable.

Add-ons

The Add-ons section lets you manage secondary scripts, called “Add-ons” that extends Blender’s functionality. Most of the time you can get add-ons as part of the Extensions system.

In this section you can search, install, enable and disable Add-ons.

Tip

If the Add-on does not activate when enabled, check the Console window for any errors that may have occurred.

Filtering Add-ons

Search Add-ons

Blender comes with some preinstalled Add-ons already, ready to be enabled. But you can also add your own, or any interesting ones you find on the web.

Enabled Add-ons Only

Shows only enabled add-ons for the current Category.

Add-on Tags

Add-ons are assigned categories by what areas of Blender they affect.

Add-on Settings

Refresh Local

Scan extension & legacy add-ons for changes to modules & meta-data (similar to restarting). Any issues are reported as warnings.

Install from Disk

Install an extension from a `.zip` package. This is installed to a Local Repository and no updates will be available.

This can also be used to install legacy Add-ons, for more information see: Installing Legacy Add-ons.

Enabling & Disabling Add-ons

To enable or disable an add-on check or uncheck the box to the right of the add-ons.

The add-on functionality should be immediately available.

Add-on Information

You can click the arrow at the left of the add-on box to see more information, such as its location, a description and a link to the documentation. Here you can also find a button to report a bug specific of this add-on.

Add-on Preferences

Some add-ons may have their own preferences which can be found in the *Preferences* section of the add-on information box.

Some add-ons use this section for example to enable/disable certain functions of the add-on. Sometimes these might even all default to off. So it is important to check if the enabled add-on has any particular preferences.

Installing Legacy Add-ons

To install legacy add-ons, click the *Install from Disk* menu item and select the add-on’s `.py` file (if it has only one such file) or its `.zip` file.

The add-on will not be automatically enabled after installation; click the checkbox to do that.

Refresh

Scans the Add-on Directory for new add-ons.

Tip

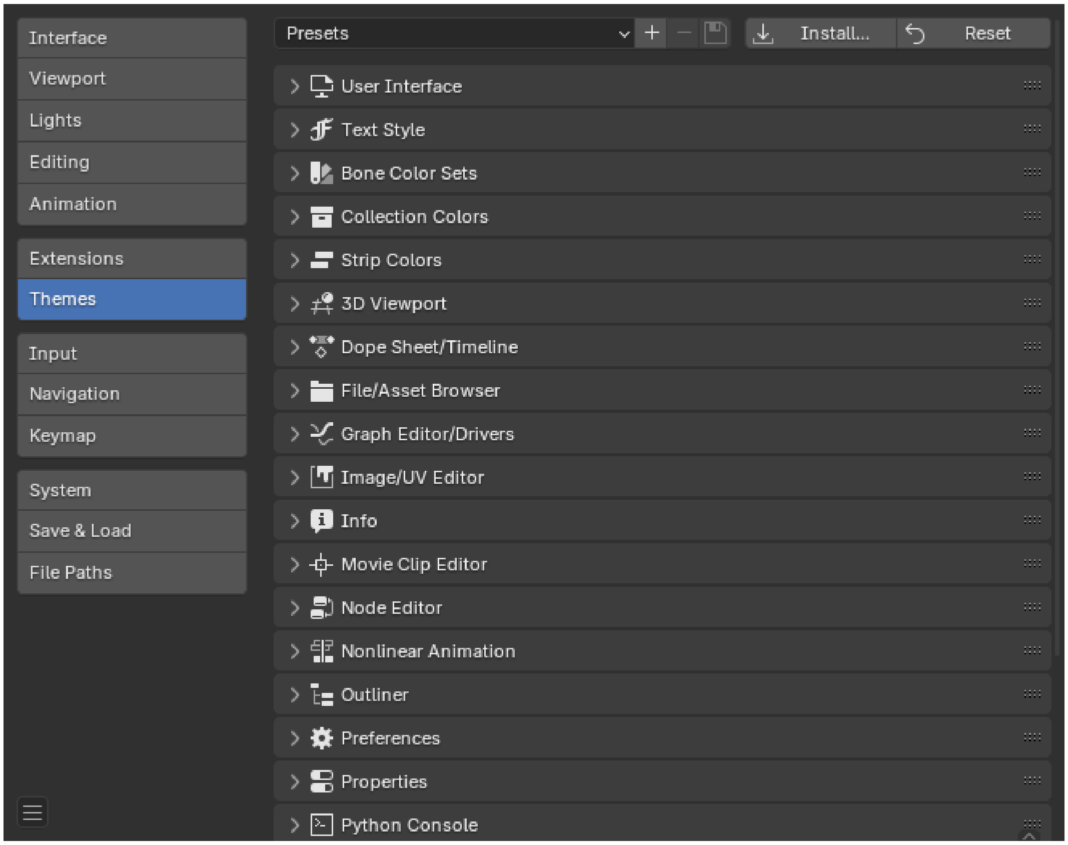
While this screen doesn't allow installing a folder-based addon with loose `.py` files, you can still do so by adding it as a Script Directory:

1. Create an empty directory in a location of your choice (e.g. `my_scripts`).
2. Add a subdirectory under `my_scripts` called `addons` (it *must* have this name for Blender to recognize it).
3. Place your addon folder inside this `addons` folder.
4. Open the *File Paths* section of the *Preferences*.
5. Add a *Script Directories* entry pointing to your script folder (e.g. `my_scripts`).
6. Save the preferences and restart Blender for it to recognize the new add-on location.

The add-ons in this folder will automatically become available; all you need to do is enable them.

Themes

The *Themes* section allows you to customize interface appearance and colors.


Interface
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Presets
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Reset
User Interface
Text Style
Bone Color Sets
Collection Colors
Strip Colors
3D Viewport
Dope Sheet/Timeline
File/Asset Browser
Graph Editor/Drivers
Image/UV Editor
Info
Movie Clip Editor
Node Editor
Nonlinear Animation
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Python Console

The colors for each editor can be set separately by simply selecting the editor you wish to change in the multi-choice list at the left, and adjusting colors as required. Notice that changes appear in real-time on your screen. In addition, details such as the dot size in the *3D Viewport* or the *Graph Editor* can also be changed.

Preset Management

Theme Presets

Select the Theme from a list of predefined Themes.

You add a custom theme to the preset list by `LMB` on the *Add* button `+`.

You remove a custom theme from the preset list by `LMB` on the *Remove* button `-`.

You save a custom theme in the preset list by `LMB` on the *Save* button.

This will save the theme to an XML file in the `./scripts/presets/interface_theme/` subdirectory of one of the configuration directories.

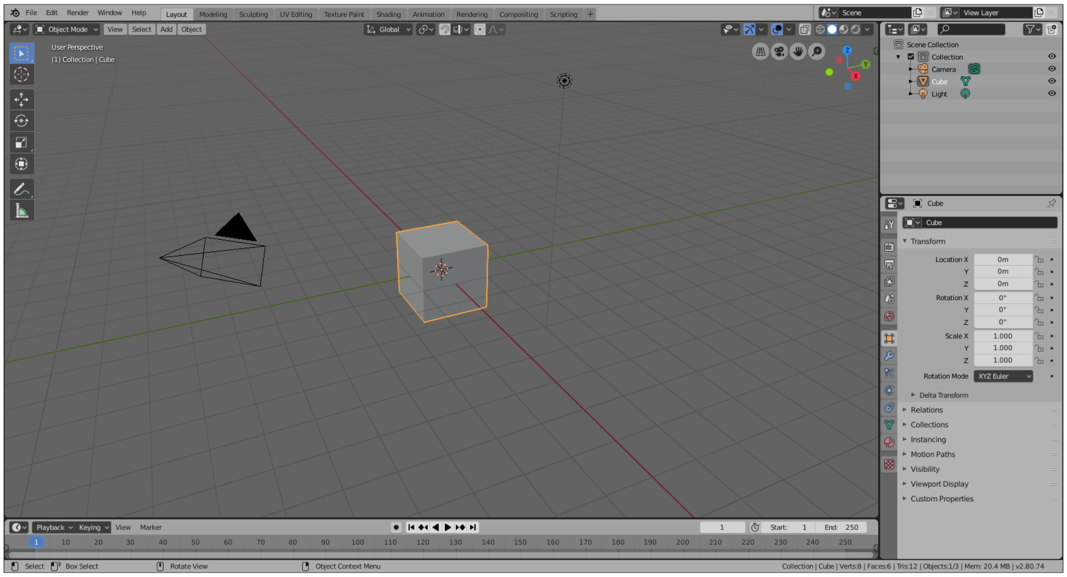
Install

Load and apply a Blender XML theme file and add it to the list of theme presets.

Reset

Reset to the default theme colors.

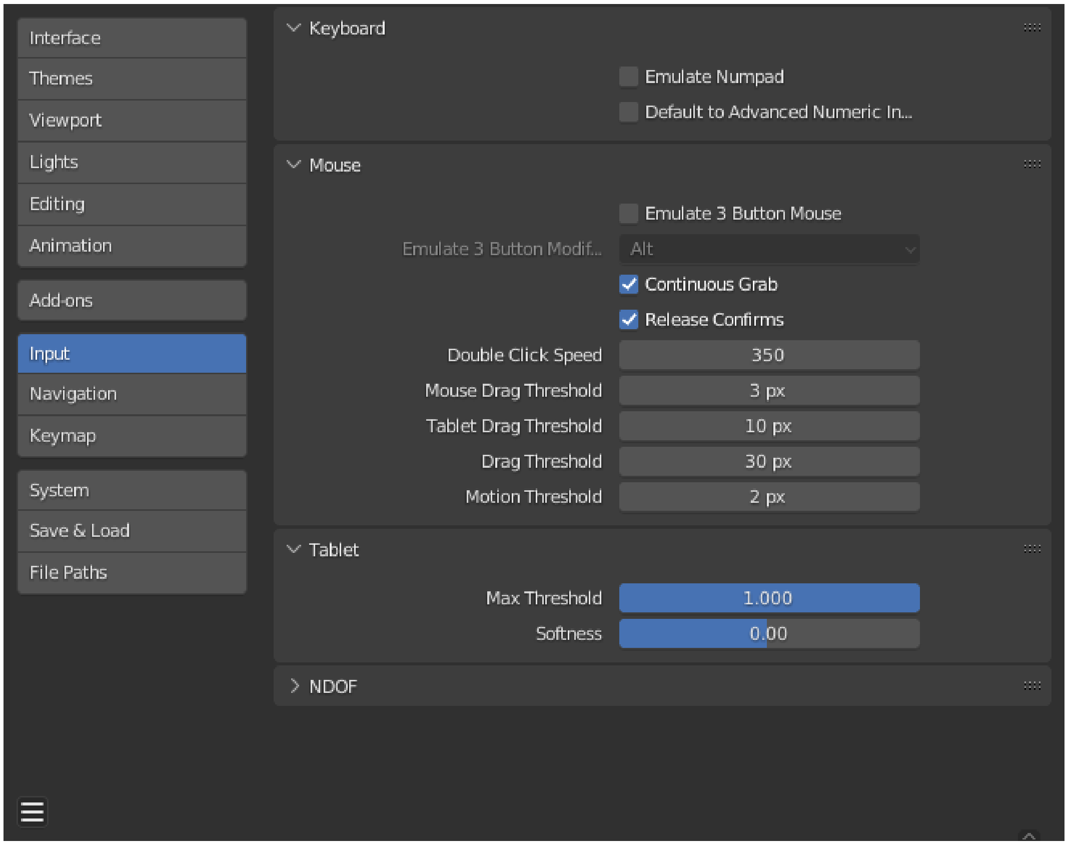
Blender comes bundled with a small selection of themes.


File Edit Render Window Help
Layout Modeling Sculpting UV Editing Texture Paint Shading Animation Rendering Compositing Scripting
Scene
View Layer
Object Mode View Select Add Object
Global
User Perspective
(1) Collection | Cube
Scene Collection
Collection
Camera
Cube
Light
Cube
Transform
Location X 0m
Y 0m
Z 0m
Rotation X 0°
Y 0°
Z 0°
Scale X 1.000
Y 1.000
Z 1.000
Rotation Mode XYZ Euler
Delta Transform
Relations
Collections
Instancing
Motion Paths
Visibility
Viewport Display
Custom Properties
Playback Keying View Marker
Start: 1 End: 250
Select Box Select Rotate View Object Context Menu
Collection | Cube | Verts:8 | Faces:6 | Tris:12 | Objects:1/3 | Mem: 20.4 MB | v2.80.74

This is an example of the theme *Blender Light*.

Input

In the Input preferences, you can customize how Blender reacts to the mouse and keyboard as well as define your own keymap.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Keyboard

☐ Emulate Numpad

☐ Default to Advanced Numeric In...

Mouse

☐ Emulate 3 Button Mouse

Emulate 3 Button Modif... Alt

☑ Continuous Grab

☑ Release Confirms

Double Click Speed 350

Mouse Drag Threshold 3 px

Tablet Drag Threshold 10 px

Drag Threshold 30 px

Motion Threshold 2 px

Tablet

Max Threshold 1.000

Softness 0.00

NDOF

Keyboard

Emulate Numpad

The Numpad keys are used quite often in Blender and are not assigned to the same action as the regular number keys. If you have a keyboard without a Numpad (e.g. on a laptop), you can tell Blender to treat the standard number keys as Numpad keys by checking *Emulate Numpad*.

Default to Advanced Numeric Input

For transform mode, default to Advanced Mode, otherwise Simple Mode is used.

Mouse

Emulate 3 Button Mouse

Blender can be configured to work with pointing devices which do not have an `MMB`. The functionality of the three mouse buttons by holding `Alt-LMB`.

Mouse/Keyboard combinations referenced in this manual can be expressed with the combinations shown in the table. For example:

`MMB` drag becomes `Alt-LMB` drag for example.

Warning

This option prevents certain features from being accessed, since `Alt-LMB` is used for some operations.

- Modifying multiple items values at once (objects, bones… etc).
- Deselecting edge/face rings in Edit Mode.
- Detaching node links.
- Moving the Compositor background image.

Some touchpads support three-finger tap for middle mouse button, which may be an alternative to using this option.

Modifier

The modifier key to press to emulate the middle mouse keybindings. This option is unsupported on Microsoft Windows.

Alt::	Use the `Alt` key to emulate the middle mouse button.
OSKey::	Use the `OSKey` to emulate the middle mouse button.

This has the advantage that it doesn't conflict with existing `Alt-MMB` shortcuts, noted above.

Continuous Grab

This feature is used to prevent the problem where an action such as moving objects or panning a view, is limited by your screen bounds.

This is done by warping the mouse within the view.

Note

Cursor warping is only supported by *relative* input devices (mouse, trackball, trackpad).

Graphics tablets, however, typically use *absolute* positioning, this feature is disabled when a tablet is being used.

This is detected for each action, so the presence of a tablet will not disable *Continuous Grab* for mouse cursor input.

Release Confirms

Dragging `LMB` on an object will move it. To confirm this (and other) transform, an `LMB` is necessary by default. When this option is activated, the release of `LMB` acts as confirmation of the transform.

Double Click Speed

The time in milliseconds to trigger a double click.

Mouse Drag Threshold

The number of pixels that a User Interface element has to be moved before it is recognized by Blender, values below this will be detected as click events.

Tablet Drag Threshold

The drag threshold for tablet events.

Drag Threshold

The drag threshold for non mouse/tablet events (keyboard or NDOF for example).

This affects Pie Menu on Drag keymap preference.

Motion Threshold

The number of pixels the cursor must be moved before the movement is registered. This is helpful for tablet pens that are a lot more difficult to keep still, then this could help to reduce stuttering of the cursor position.

Note

Unlike the click/drag distinction, this is used to detect small movements for example, picking selection cycles through elements near the cursor. Once the cursor moves past this threshold, selection stops cycling and picks the closest item.

Touchpad

Note

This panel is available on Windows, macOS, and Linux with Wayland.

Multi-touch Gestures

Use multi-touch gestures for navigation with touchpad, instead of scroll wheel emulation. For more detail on supported gestures, see Configuring Peripherals.

Scroll Direction

The direction scrolling responds to the scroll gestures.

Only available on Linux using Wayland.

Traditional::	Scrolls content down when gestures move up.
Natural::	Scrolls content up when gestures move up.

Tablet

Tablet API (Windows only)
: Select the native Windows Ink or older Wintab system for pressure sensitivity. Blender automatically selects the API for your operating system and tablet, however in case of problems this can be set manually. You may need to restart Blender for changes to take affect.

Max Threshold
: Amount of pressure required to achieve full intensity.

Softness
: Controls how the softness of the low pressure response onset using a gamma curve.

NDOF

These preferences control how an NDOF device interacts with the 3D Viewport. These preferences can also be accessed using the `NDOFMenu` button on the NDOF device to open a pop-up menu to adjust the settings directly from the 3D Viewport.

Pan Sensitivity
: The overall sensitivity for panning in the 3D Viewport.

Orbit Sensitivity
: The overall sensitivity for orbiting in the 3D Viewport.

Deadzone
: The threshold for the amount of movement needed from the device's rest position for Blender to interrupt that movement.

Navigation
: Navigation style for the viewport.

Free::	Uses the full 6-degrees of freedom.
Orbit::	Orbit about the view center.

Rotation

Rotation style for the viewport.

Turntable::	Rotates the view keeping the horizon horizontal.
Trackball::	Is less restrictive, allowing any orientation.

Show Navigation Guide

Display the pivot point and axis during rotation.

Invert Zoom

Zoom using opposite direction.

Lock Camera Pan/Zoom

Pan/zoom the camera view instead of leaving the camera view when orbiting.

Pan – Swap Y and Z Axes

Pan using up/down on the NDOF devices instead of forward/backwards.

Invert Axis Pan

Reverses the panning axis on the selected axes.

Orbit

Reverses the orbit axis on the selected axes.

Fly/Walk

Settings to control how the NDOF device is used while using Walk/Fly Navigation.

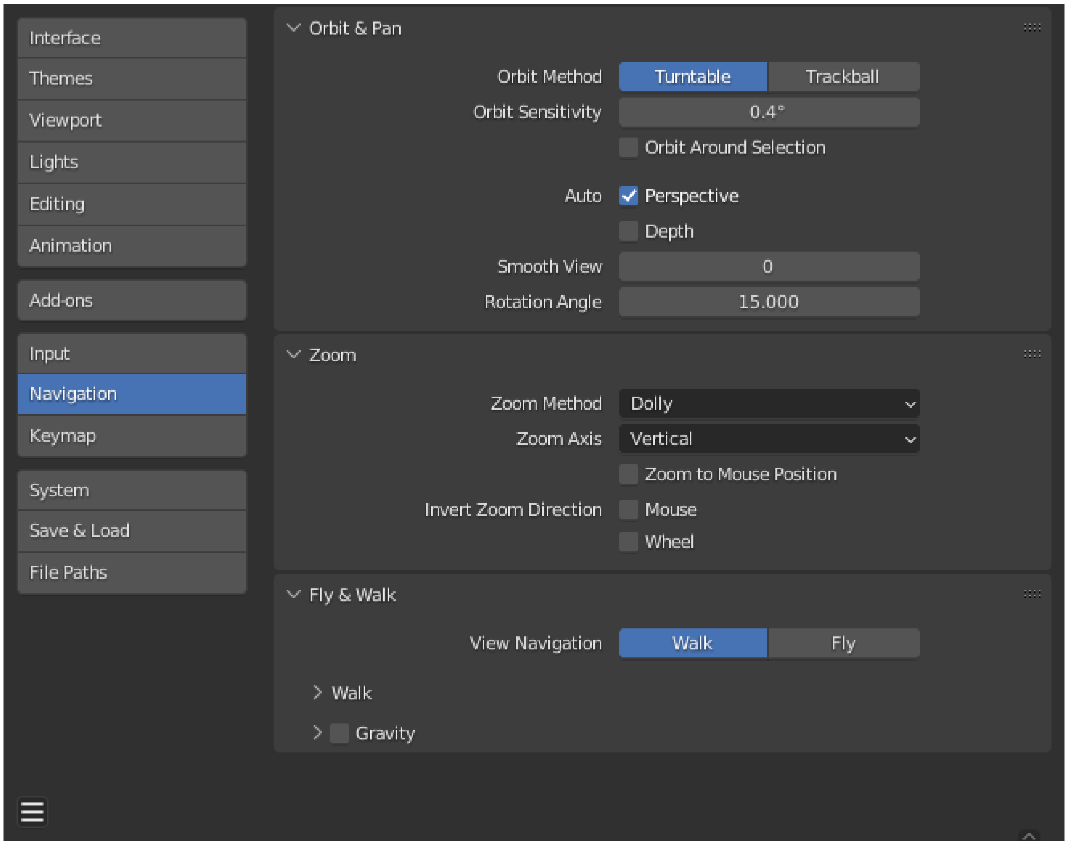
Lock Horizon

Keeps the horizontal axis level while flying.

Helicopter Mode

Moves the 3D Viewport up or down when moving the NDOF device up/down.

Navigation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Orbit & Pan

Orbit Method: Turntable | Trackball

Orbit Sensitivity: 0.4°

☐ Orbit Around Selection

Auto: ☑ Perspective

☐ Depth

Smooth View: 0

Rotation Angle: 15.000

Zoom

Zoom Method: Dolly

Zoom Axis: Vertical

☐ Zoom to Mouse Position

Invert Zoom Direction: ☐ Mouse

☐ Wheel

Fly & Walk

View Navigation: Walk | Fly

> Walk

> ☐ Gravity

Blender Preferences navigation section.

Orbit & Pan

Orbit Method

Choose you are preferred method of interactively rotating the 3D Viewport.

Turntable::	Rotates the view keeping the horizon horizontal. This behaves like a potter’s wheel or record player where you have two axes of rotation available, and the world seems to have a better definition of what is “Up” and “Down” in it.

	The drawback to using the *Turntable* style is that you lose some flexibility when working with your objects. However, you gain the sense of “Up” and “Down” which can help if you are feeling disoriented.
Trackball::	Is less restrictive, allowing any orientation.

Orbit Sensitivity

Adjusts the reactivity/speed of orbiting in the 3D Viewport. This setting works differently depending on what *Orbit Method* is used:

- Turntable: *Orbit Sensitivity* controls the amount of rotation per-pixel to control how fast the 3D Viewport rotates.
- Trackball: *Orbit Sensitivity* as a simple factor for how fast the 3D Viewport rotates.

Orbit Around Selection

The selection center becomes the rotation center of the viewport. When there is no selection the last selection will be used.

The method used to calculate the center depends on the the current mode:

- Object mode uses the selections bounding box center.
- Edit & pose mode use the selected elements center.
- Paint modes use the center of the last brush stroke.

Note

While this may seem like ideal behavior, it can be inconvenient for larger objects such as a terrain mesh, where the center is not necessarily a point of interest.

Auto – Perspective

When enabled, the view switches to Perspective when orbiting the view, and to Orthographic when aligning to an axis (Top, Side, Front, Back, etc.).

When disabled, this switching needs to be done manually.

Auto – Depth

Use the depth under the mouse to improve view pan, rotate, zoom functionality. Useful in combination with *Zoom To Mouse Position*.

Smooth View

Time (in milliseconds) the animation takes when changing views (Top/Side/Front/Camera…). Reduce to zero to remove the animation.

Rotation Angle

Rotation step size in degrees, when `Numpad4`, `Numpad6`, `Numpad8`, or `Numpad2` are used to rotate the 3D Viewport.

Zoom

Zoom Method

Choose your preferred style of zooming in and out, when using interactive zoom.

Scale::	*Scale* zooming depends on where you first click in the view. To zoom out, move the cursor to the area center. To zoom in, move the cursor away from the area center.
Continue::	The *Continue* zooming option allows you to control the speed (and not the value) of zooming by moving away from the initial cursor position. Moving up from the initial click point or to the right will zoom out, moving down or to the left will zoom in. The further away you move, the faster the zoom movement will be. The directions can be altered by the *Vertical* and *Horizontal* radio buttons and the *Invert Zoom Direction* option.
Dolly::	*Dolly* zooming works similarly to *Continue* zooming except that zoom speed is constant.

Zoom Axis

The axis of the mouse to use for zooming.

Vertical::	Moving up zooms out and moving down zooms in.
Horizontal::	Moving left zooms in and moving right zooms out.

Zoom to Mouse Position

When enabled, the mouse pointer position becomes the focus point of zooming instead of the 2D window center. Helpful to avoid panning if you are frequently zooming in and out.

Tip

This is useful in combination with Auto Depth to quickly zoom into the point under the cursor.

Invert Zoom Direction – Mouse

Inverts the Zoom direction for *Dolly* and *Continue* zooming.

Invert Zoom Direction – Wheel

Inverts the direction of the mouse wheel zoom.

Fly & Walk

View Navigation

The default mode for interactive first person navigation.

See Fly/Walk Navigation.

Walk

Reverse Mouse

Inverts the mouse’s Y movement.

Mouse Sensitivity
: Speed factor for when looking around, high values mean faster mouse movement.

Teleport Duration
: Interval of time warp when teleporting in navigation mode.

Walk Speed
: Base speed for walking and flying.

Speed Factor
: The multiplication factor for the speed boost.

Gravity

Simulates the effect of gravity when walking.

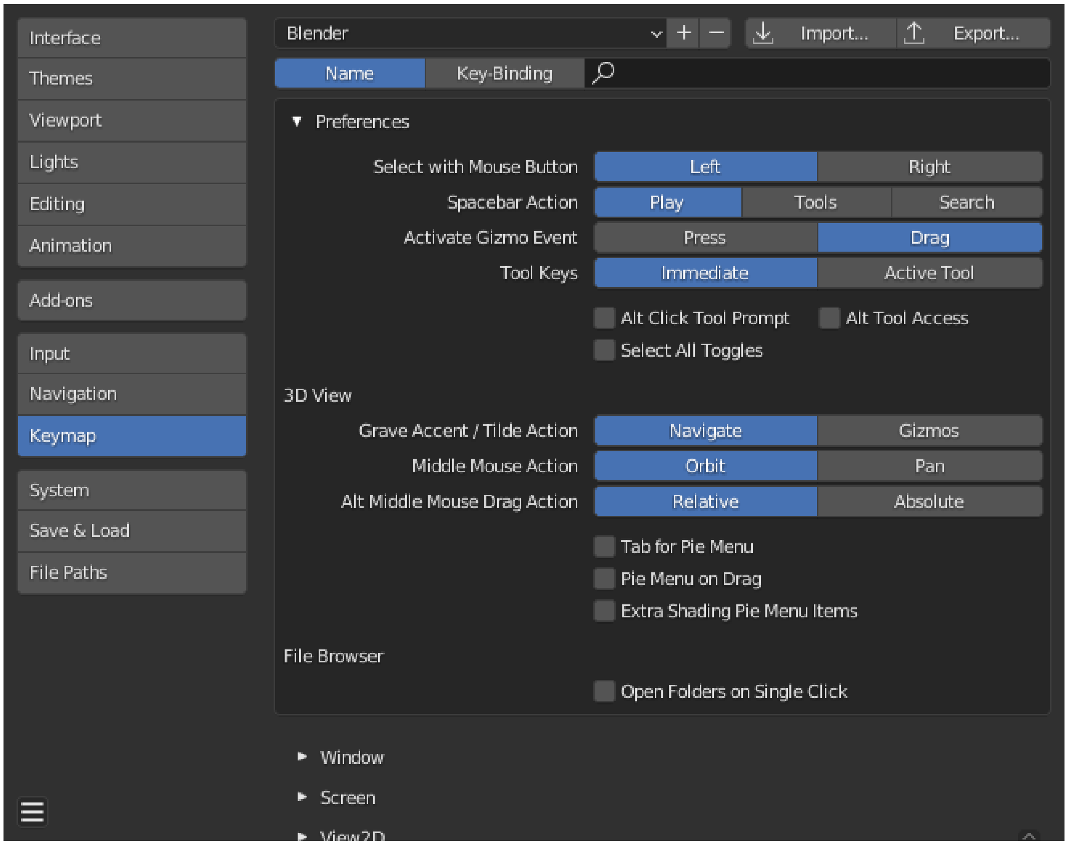
View Height
: The distance from the ground floor to the camera when walking.

Jump Height
: The maximum height of a jump.

Keymap

The keymap editor lets you adjust your keymap via:

Presets::	Predefined keymaps which come with Blender and can be added to.
Preferences::	Keymaps may define their own preferences to change the functionality or add additional key bindings.
Key Map Items::	You may add/remove/edit individual keymap entries.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Name
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3D View
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View2D

Select with Mouse Button: [✓ Left] Right

Spacebar Action: [✓ Play] Tools Search

Activate Gizmo Event: Press [✓ Drag]

Tool Keys: [✓ Immediate] Active Tool

☐ Alt Click Tool Prompt ☐ Alt Tool Access

☐ Select All Toggles

Grave Accent / Tilde Action: [✓ Navigate] Gizmos

Middle Mouse Action: [✓ Orbit] Pan

Alt Middle Mouse Drag Action: [✓ Relative] Absolute

☐ Tab for Pie Menu

☐ Pie Menu on Drag

☐ Extra Shading Pie Menu Items

☐ Open Folders on Single Click

Blender Preferences Keymap section.

Preset Management

Keymap Presets

Select the keymap from a list of predefined keymaps.

You add a custom keymap configuration to the preset list by `LMB` on the *Add* button `+`.

You remove a custom keymap configuration from the preset list by `LMB` on the *Remove* button `-`.

Import

Importing opens a File Browser to select a `.py` file to add to the list of keymap presets.

Export

Saves the current keymap configuration as a preset others may use.

All Keymaps

When disabled, only the keymaps and categories that have been modified by the user will be exported. In addition, add-ons may register keymaps to their respective functions, however, these keymaps are not exported unless changed by the user. This exported file may be thought of as a *"keymap delta"* instead of a full keymap export.

When enabled, the entire keymap is written.

Filtering

Filter Type

Name::	Search the keymap item by the operator name it runs.
Key Binding::	Search the keymap item by the key used to activate it. **Hint** You could for example search with `Ctrl Shift C` for keymap items that use all these keys.

Search
The text to search (leave blank to disable).

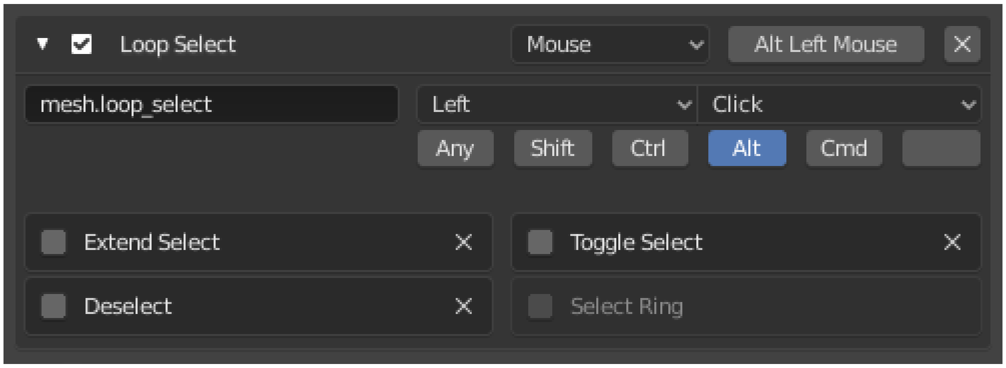
Preferences

Keymaps may define their own preferences, these are predefined adjustments to the keymap you can make without having to manually adjust individual keymap items which can cause problems with newer Blender Versions.

See the default keymap preferences for options available in the default keymap.

Editor

The Keymap editor lets you change the default hotkeys. You can change keymaps for each of Blender's editors.



▼ ☑ Loop Select
Mouse
Alt Left Mouse
mesh.loop_select
Left
Click
Any
Shift
Ctrl
Alt
Cmd
☐ Extend Select
☐ Toggle Select
☐ Deselect
☐ Select Ring

Keymap editor.

Usage

1. Select the keymap you want to change and click on the white arrows to open up the keymap tree.
2. Select which Input will control the function.
3. Change hotkeys as you want. Just click on the shortcut input and enter the new shortcut.

Active

Uncheck to disable this keymap item.

Map Type

Keyboard::	Single hotkey or key combination.
Mouse::	Actions from mouse buttons, tablet or touchpad input.
NDOF::	Movement or button from a 3D mouse (NDOF) device.
Tweak::	Mouse click and drag *(optionally map drag direction to different actions)*.
Text Input::	Use this function by entering a text.
Timer::	Used to control actions based on a time period. E.g. by default, *Animation Step* uses "Timer 0", *Smooth View* uses "Timer 1".

Operator ID Name

The identifier for the operator to call.

> **Hint**
>
> See `bpy.ops` for a list of operators (remove the `bpy.` prefix for the identifier).

Event

Type

The key or button that activates this keymap item (depending on the map type).

Value

The action (such as press, release, click, drag, etc.), (depending on the map type).

Modifier

Additional keys to hold (such as `Ctrl`, `Shift`, `Alt`).

Operator Properties

Changes to the defaults properties this operator is activated with

See also

Keymap Customization for more information on keymap editing.

Restoring

If you want to restore the default settings for a keymap, just click on the *Restore* button at the top right of this keymap.

Tip

Instead of deleting the default keymap to create your custom one, you can just add a new *Preset* for both the mouse and keyboard.

Known Limitations

Blender Versions

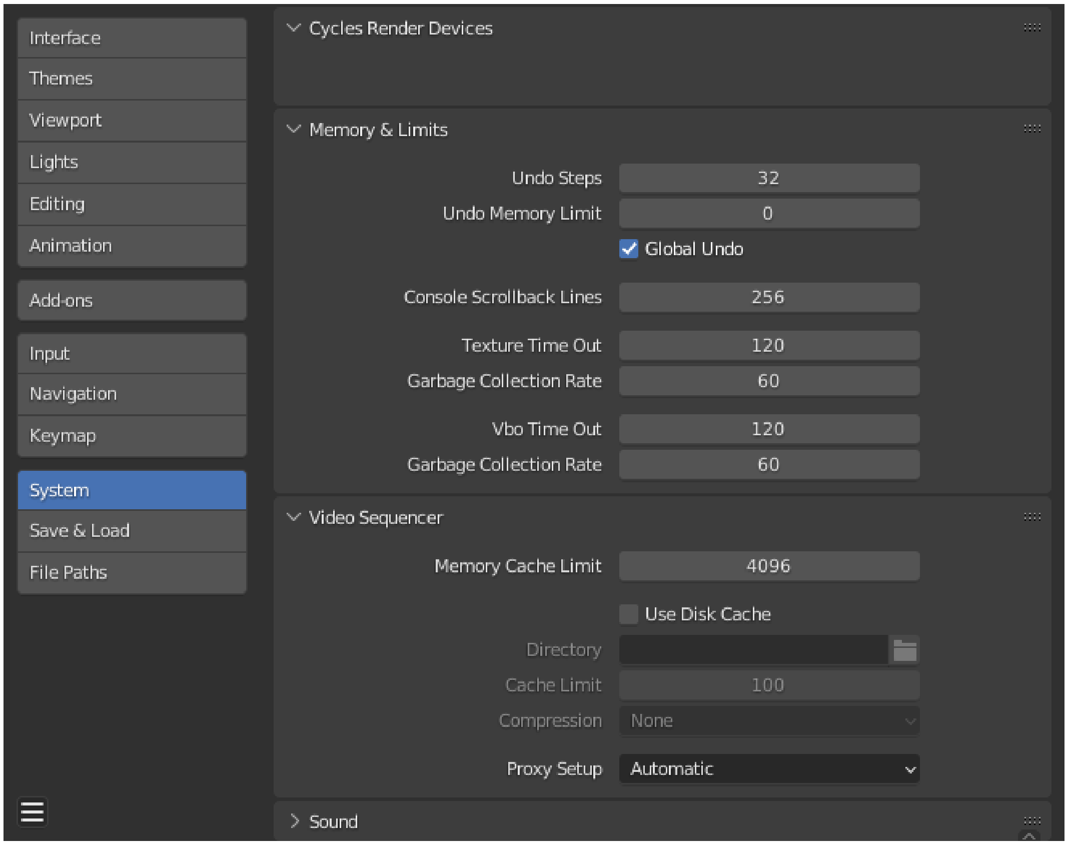
A problem with modifying your own keymap is newer Blender versions key change the way tools are accessed, breaking your customized keymap.

While the keymap can be manually updated, the more customizations you make, the higher the chance of conflicts in newer Blender versions is.

System

The *System* section allows you to set graphics card options, memory limits & sound settings.

If your hardware does not support some of the options described on this page, then they will either not be displayed or be corrected on startup.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Cycles Render Devices

Memory & Limits

Undo Steps: 32
Undo Memory Limit: 0
☑ Global Undo
Console Scrollback Lines: 256
Texture Time Out: 120
Garbage Collection Rate: 60
Vbo Time Out: 120
Garbage Collection Rate: 60

Video Sequencer

Memory Cache Limit: 4096
☐ Use Disk Cache
Directory:
Cache Limit: 100
Compression: None
Proxy Setup: Automatic

Sound

Preferences System section.

Cycles Render Device

Changes the computing device the Cycles render engine uses to render images. Cycles can use either the CPU or certain GPUs to render images, for more information see the GPU Rendering page.

None::	When set to *None* or when the only option is *None*: the CPU will be used as the computing device for Cycles.
CUDA::	If the system has a compatible Nvidia CUDA device, it will be available as an option for rendering with Cycles.
OptiX::	If the system has a compatible Nvidia OptiX device, it will be available as an option for rendering with Cycles.
HIP::	If the system has a compatible AMD HIP device, it will be available as an option for rendering with Cycles.
oneAPI::	If the system has a compatible Intel oneAPI device, it will be available as an option for rendering with Cycles.
Metal::	If the system has a compatible Apple Metal device, it will be available as an option for rendering with Cycles.

Distribute Memory Across Devices

Allocates resources across multiple GPUs rather than duplicating data, effectively freeing up space for larger scenes. Note that in order for this option to be available, the GPUs must be connected together with a high bandwidth communication protocol.

Currently only NVLink on Nvidia GPUs is supported.

Embree on GPU

Enables the use of hardware ray tracing on Intel GPUs, providing better overall performance.

Only supported with oneAPI rendering devices..

HIP RT (Experimental)

Speeds up rendering by enabling AMD hardware ray tracing on RDNA2 and above, with shader fallback on older cards. This feature is experimental and some scenes may render incorrectly.

This feature is only available when using a *HIP* render device.

MetalRT

MetalRT for ray tracing uses less memory for scenes which use curves extensively, and can give better performance in specific cases.

Off::	Disable MetalRT (uses BVH2 layout for intersection queries).
On::	Enable MetalRT for intersection queries.
Auto::	Automatically pick the fastest intersection method.

Operating System Settings

Make this installation your default Blender (MS-Windows & Linux only).

On Linux, if Blender is installed from a package manager such as Snap, file association is handled by the package manager.

Register

Make the currently in use Blender installation the default for generating thumbnails and the default for opening blend-files.

Unregister

Remove file association & thumbnailer.

For All Users

Register Blender for all users, requires escalated privileges.

Linux Registration

Files are setup files under: `/usr/local` for all users, otherwise `~/.local` is used.

- A desktop file & icon is installed so the application is available in launchers.
- A file association for `*.blend` is setup.

- The thumbnailer is installed so blend-file thumbnails will be shown in file managers (**For All Users** only).

Network

Allow Online Access
: Allow Blender to access the internet.

  Add-ons that follow this setting will only connect to the internet if enabled. However, Blender cannot prevent third-party add-ons from violating this rule.

Time Out
: The time (in seconds) that online operations may wait before timing out.

  Use the systems default when zero.

Connection Limit
: The maximum number of simultaneous connections an online operation may make.

  Do not limit the number of connections when zero.

Memory & Limits

Undo Steps
: Number of Undo steps available.

Undo Memory Limit
: Maximum memory usage in Mb (0 is unlimited).

Global Undo
: This enables Blender to save actions done when you are **not** in *Edit Mode*. For example, duplicating objects, changing panel settings or switching between modes.

Warning

While disabling this option does save memory, it stops the Adjust Last Operation panel from functioning, also preventing tool options from being changed in some cases. For typical usage, its best to keep this enabled.

See also

Read more about Undo and Redo options.

Console Scroll-back Lines

The number of lines, buffered in memory of the console window. Useful for debugging purposes and command-line rendering.

Texture Time Out

Time since last access of a GL texture in seconds, after which it is freed. Set this to 0 to keep textures allocated.

Garbage Collection Rate

Number of seconds between each run of the GL texture garbage collector.

VBO Time Out

Time since last access of a GL vertex buffer object (VBO) in seconds after which it is freed (set to 0 to keep VBO allocated).

Garbage Collection Rate

Number of seconds between each run of the GL vertex buffer object garbage collector.

Video Sequencer

Memory Cache Limit

Upper limit of the Video Sequencer and Movie Clip Editor memory cache (in megabytes). For an optimal Clip editor and Sequencer performance, high values are recommended.

Disk Cache

Writes cached strips to disk which can store a lot more than RAM. To use the Disk Cache, this option must be enabled, the *Disk Cache Directory* and *Disk Cache Limit* set, then save or reopen the existing blend-file.

Directory

The location on disk to store the cache.

Cache Limit

Upper limit of the Video Sequencer's disk cache (in gigabytes), setting to zero disables disk cache.

Compression

The level of compression to compress image in the disk cache. This has a trade off between saving disk space and requiring more processing. The more compression used requires faster disk write/read speeds and more CPU usage.

Proxy Setup

When and how Proxies are created.

Automatic::	Build proxies for added movie and image strips in each preview size.
Manual::	Set up proxies manually.

See also

Sequencer Cache Properties

Sound

This panel contains the sound settings for live playback within Blender and are only available with a device other than *None*. To control these settings for exporting sound see the Encoding Panel and Audio Panel.

Audio Device

Sets the audio engine to use to process and output audio.

None::	No audio playback support (audio strips can still be loaded and rendered normally).
CoreAudio::	On macOS, CoreAudio is the native audio API. This is the default setting for macOS users and should be preferred.
PulseAudio::	PulseAudio is the most commonly used sound server on modern Linux distributions. If PulseAudio is available, this should be the preferred setting on Linux.
WASAPI::	On Windows, WASAPI is the native audio API introduced with Windows Vista. This is the default setting for Windows users and should be preferred.
Jack::	High quality professional audio engine that needs a properly configured server running on your system. Supports accurate synchronization with other professional audio applications using Jack.
OpenAL::	Available on all platforms in case the native engines do not work. The played back 3D audio might sound different than when rendered.
SDL::	Uses Simple Direct Media Layer API from libsdl.org which supports all platforms. Might be of lower quality and thus should only be used as backup.

Channels

The number of audio source “locations” to output.

Mono::	Output a single audio channel.
Stereo::	Output two audio channels; typically a left and right channel.

4 Channels::	Output a four audio channels.
5.1 Surround::	Output a five audio channels with one LFE channel.
7.1 Surround::	Output a seven audio channels with one LFE channel.

Mixing Buffer

Sets the number of samples used by the audio mixing buffer. Higher buffer sizes can cause latency issues, but if you hear clicks or other problems, try to increase the size.

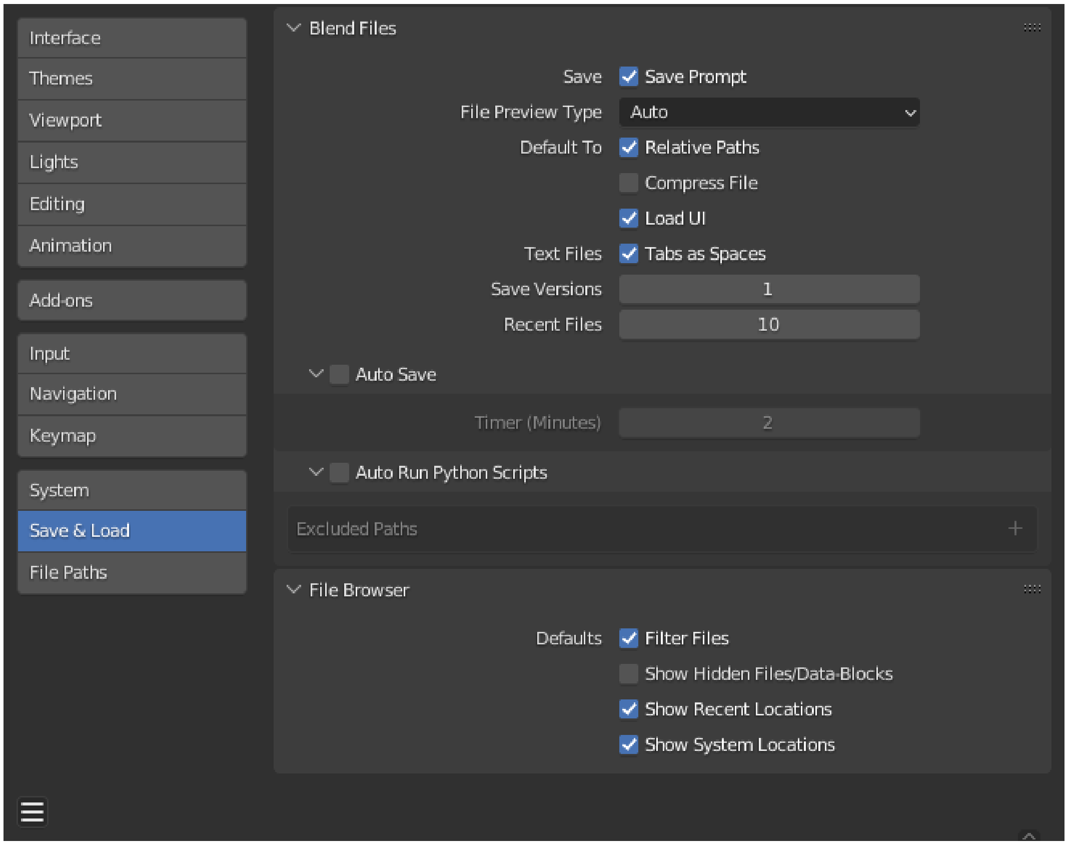
Sample Rate

Sets the audio sampling rate.

Sample Format

Sets the audio sample format.

Save & Load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Blend Files

Save ☑ Save Prompt

File Preview Type Auto

Default To ☑ Relative Paths

☐ Compress File

☑ Load UI

Text Files ☑ Tabs as Spaces

Save Versions 1

Recent Files 10

☐ Auto Save

Timer (Minutes) 2

☐ Auto Run Python Scripts

Excluded Paths

File Browser

Defaults ☑ Filter Files

☐ Show Hidden Files/Data-Blocks

☑ Show Recent Locations

☑ Show System Locations

Preferences Save/Load section.

Blend Files

Save – Save Prompt

Asks for confirmation before closing or opening a new blend-file if the current file has unsaved changes.

Save Versions

Number of versions created (for backup) when saving newer versions of a file.

This option keeps saved versions of your file in the same directory, using extensions: `.blend1`, `.blend2`, etc., with the number increasing to the number of versions you specify.

Older files will be named with a higher number. E.g. with the default setting of 2, you will have three versions of your file:

- `*.blend` – last saved.
- `*.blend1` – second last saved.
- `*.blend2` – third last saved.

Recent Files

Number of files displayed in *File* ‣ *Open Recent*.

Auto Save

Enables Auto Save. Tells Blender to *automatically* save a backup copy of your work-in-progress files to the Temporary Directory.

Timer (Minutes)

This specifies the number of minutes to wait between each Auto Save. The default value of the Blender installation is 2 minutes. The minimum is 1, and the Maximum is 60 (save every hour).

File Preview Types

Select how blend-file preview are generated. These previews are used both in the File Browser and for previews shown in the operating system's file browser.

None::	Do not generate any blend-file previews.
Auto::	If there is no camera in the 3D Viewport a preview using a screenshot of the active Workspace is generated. If a camera is in the scene, a preview of the viewport from the camera view is used.
Screenshot::	Generate a preview by taking a screenshot of the active Workspace.
Camera View::	Generate a preview of a Workbench render from the camera's point of view.

Default To – Relative Paths
Default value for Relative Paths when loading external files such as images, sounds, and linked libraries. It will be ignored if a path is already set.

Default To – Compress File
Default value for Compress file when saving blend-files.

Default To – Load UI
Default value for Load UI when loading blend-files.

Text Files – Tabs as Spaces
Entering `Tab` in the Text Editor adds the appropriate number of spaces instead of using characters.

Auto Run Python Scripts

Python scripts (including driver expressions) are not executed by default for security reasons. You may be working on projects where you only load files from trusted sources, making it more convenient to allow scripts to be executed automatically.

Excluded Paths
Blend-files in these folders will *not* automatically run Python scripts. This can be used to define where blend-files from untrusted sources are kept.

See also

Python Security.

File Browser

Show Locations – Recent
Hide the *Recent* panel of the File Browser which displays recently accessed folders.

Show Locations – System

Hide System Bookmarks in the *File Browser*.

Defaults – Filter Files

By activating this, the file region in the File Browser will only show appropriate files (i.e. blend-files when loading a complete Blender setting). The selection of file types may be changed in the file region.

Defaults – Show Hidden Files/Data-Blocks

Unhide files and data-blocks with names that start with `.` in File Browsers and data IDs.

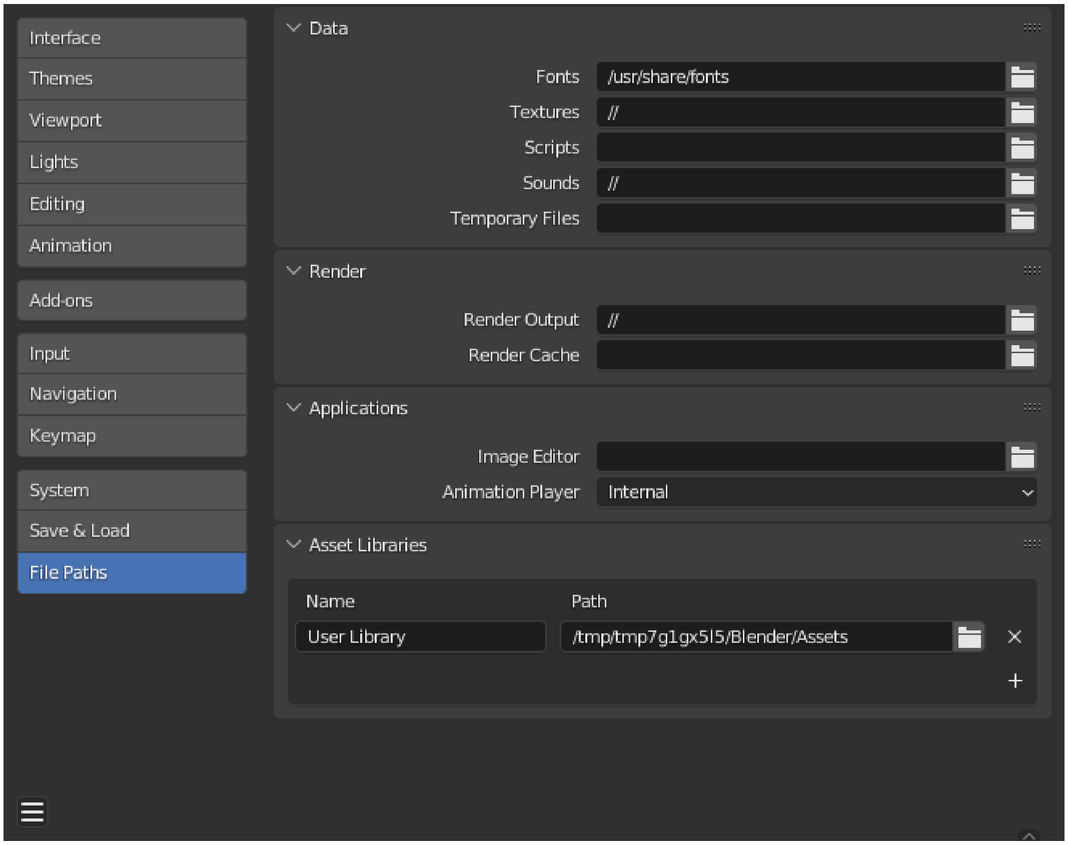
Hint

Data-blocks with names beginning with a `.` can be selected by typing in a search string that also starts with the `.` character, even if this setting is disabled.

File Paths

The *File* section in *Preferences* allows you to configure auto-save preferences and set default file paths for blend-files, rendered images, and more.

Locations for various external files can be set for the following options: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Asset Libraries

Fonts /usr/share/fonts
Textures //
Scripts
Sounds //
Temporary Files

Render Output //
Render Cache

Image Editor
Animation Player Internal

Name	Path
User Library	/tmp/tmp7g1gx5l5/Blender/Assets

Preferences File Paths section.

Hint

The default path `//` refers to the folder of the currently open blend-file (see Relative Paths for details).

Data

Fonts
Default location to browse for text object font files.

Textures
Default location to browse for image textures.

Sounds
Default location to browse for sound files.

Temporary Files
The directory for storing temporary save files. The path must reference an existing directory or it will be ignored and the systems temporary directory will be used instead. When left blank, the systems temporary directory will be used (see Temporary Directory for details).

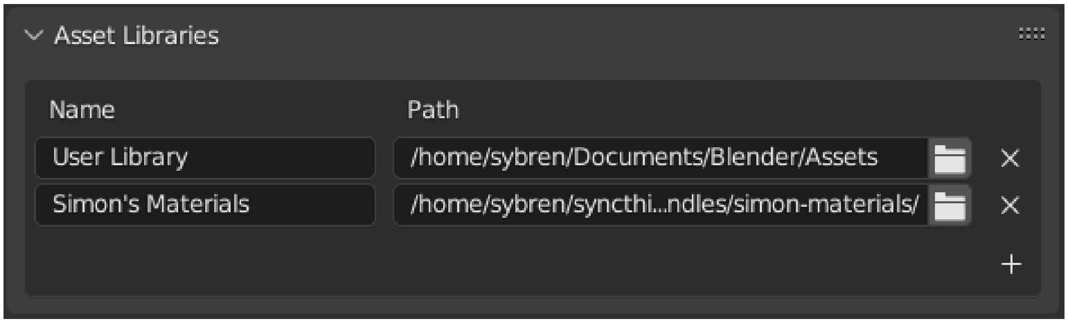
Render

Render Output
Where rendered images/videos are saved.

Render Cache
The location where cached render images are stored.

Asset Libraries

Name and on-drive directory paths of asset libraries. To make Blender aware of an asset library, add it to this list. The name is for your reference only, and will appear in asset library selectors. The path should point to the location of the asset library.



Asset Libraries

Name	Path
User Library	/home/sybren/Documents/Blender/Assets
Simon's Materials	/home/sybren/syncthi...ndles/simon-materials/

Name and Location of asset libraries in the Preferences.

To create a new asset library, just create an empty directory and add it to the List View. Any asset from any blend-file contained in that directory (or subdirectories thereof) will appear in the Asset Browser.

Import Method

Determines how data is managed when an asset is imported, unless overridden by the Asset Browser.

Link::	*Same as File ▸ Link…* The asset will be linked to the current blend-file, and thus be read-only. Later changes to the asset file will be reflected in all files that link it in.
Append::	*Same as File ▸ Append…* All of the asset and all its dependencies will be appended to the current file. Dragging a material into the scene three times will result in three independent copies. Dragging an object into the scene three times will also result in three independent copies. “Dependencies” in this case means everything the asset refers to. For an object, this can be its mesh and materials, but also other objects used by modifiers, constraints, or drivers. Since the file now has its own copy of the asset, later changes to the asset file will not be reflected in the file it’s appended to.

Append (Reuse Data)::

Specific to the Asset Browser.

The first time an asset is used, it will be appended, including its dependencies, just like described previously. However, Blender will keep track of where it originated, and the next time the asset is used, as much data as possible will be reused. Dragging a material into the scene three times will only load it once, and just assign the same material three times. Dragging an object into the scene three times will create three copies of the object, but all copies will share their mesh data, materials, etc.

Since the file now has its own copy of the asset, later changes to the asset file will not be reflected in the file it's appended to.

Relative Path

Use relative path when linking assets from this asset library.

Script Directories

Additional locations to search for Python scripts.

Each path can be given a *Name* to signify to purpose of that script directory.

By default, Blender looks in several directories (platform dependent) for scripts. By adding a user script path in the preferences an additional directory is used. This can be used to store your own scripts and add-ons independently of the current Blender version.

You will need to create specific subfolders in this path which match the structure of the `scripts` folder found in Blender's installation directory.

The following subdirectories will be used when present:

`startup/`

Modules in this folder will be imported on startup.

`addons/`
Legacy add-ons located here will be listed in the add-ons preferences.

`modules/`
Modules in this folder can be imported by other scripts.

`presets/`
Presets in this folder will be added to existing presets.

Hint

For add-ons it is now recommended to use a local extension repository if you wish to define additional locations to install and manage them.

To make use of these you will need to define them as extensions.

Note

You have to restart Blender for all changes to the users scripts to take effect.

Applications

Image Editor
The path to an external program to use for image editing.

Animation Player
The program used for playing back rendered animations via View Animation.

By default this is set to *Internal* which uses Blender's built-in animation player.

This has the advantage that all image formats supported by Blender can be played back and no 3rd party application needs to be installed.

Text Editor

Program

Command to launch the text editor when using Edit Externally, either a full path or a command in `$PATH`. Use the internal editor when left blank.

Arguments

Defines the specific format of the arguments with which the text editor opens files.

The supported expansions are as follows:

- `$filepath`: The absolute path of the file.
- `$line`: The line to open at (Optional).
- `$column`: The column to open from the beginning of the line (Optional).
- `$line0` & `$column0` similar to the above but they start at zero.

Example: `-f $filepath -l $line -c $column`

Development

Only visible when Developer Extras are enabled.

I18n Branches

The path to the `/branches` directory of your local SVN translation copy, to allow translating from the UI.

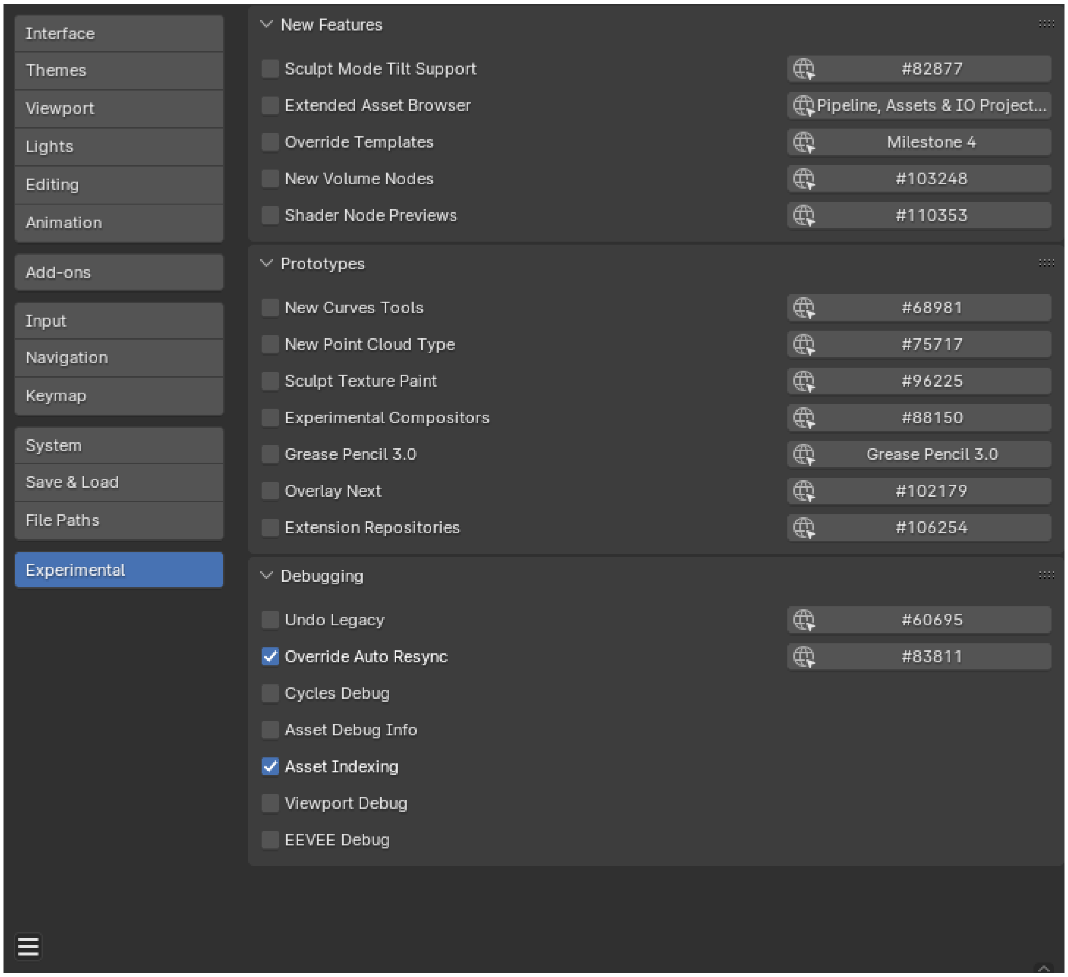
Known Limitations

Permissions on Windows

Be sure that you have the right privileges for running the executable accessing the path defined. On Windows for instance, if the option “Run this program as an administrator” is enabled for the executable, it will lead to a failure to open the editor due to a limitation within the OS User Account Control. Running a program with elevated privileges is potentially dangerous!

Experimental

These preferences are reserved for features that are currently being worked on and are not yet complete. This category can be enabled by enabling Developer Extras. Most experimental features are only available in Daily Builds.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New Features

☐ Sculpt Mode Tilt Support — #82877
☐ Extended Asset Browser — Pipeline, Assets & IO Project...
☐ Override Templates — Milestone 4
☐ New Volume Nodes — #103248
☐ Shader Node Previews — #110353

Prototypes

☐ New Curves Tools — #68981
☐ New Point Cloud Type — #75717
☐ Sculpt Texture Paint — #96225
☐ Experimental Compositors — #88150
☐ Grease Pencil 3.0 — Grease Pencil 3.0
☐ Overlay Next — #102179
☐ Extension Repositories — #106254

Debugging

☐ Undo Legacy — #60695
☑ Override Auto Resync — #83811
☐ Cycles Debug
☐ Asset Debug Info
☑ Asset Indexing
☐ Viewport Debug
☐ EEVEE Debug

Blender Preferences Experimental section.

Debugging

Undo Legacy

Use legacy undo (slower than the new default one, but may be more stable in some cases).

Override Auto Resync

Enables library overrides automatic resync detection and process on file load. Disable when dealing with older blend-files that need manual Resync (Enforce) handling.

Cycles Debug

Show the Cycles rendering debug panel.

Asset Debug Info

Enable some extra fields in the Asset Browser to aid debugging.

Asset Indexing

Disabling the asset indexer forces every asset library refresh to completely reread assets from disk.

Viewport Debug

Enable viewport debugging options for developers in the overlays pop-over.

EEVEE Debug

Enable EEVEE debuging options for developers.

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Introduction

Scenes are a way to organize your work. Each blend-file can contain multiple scenes, which share other data such as objects and materials.

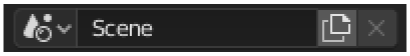
Scene management and library appending/linking are based on Blender's Library and Data System, so it is a good idea to read that manual page first, if you are not familiar with the basics of that system.

Controls

Reference

Menu:: *Topbar* ▸ *Scene*

You can select and create scenes with the *Scene* data-block menu in the Topbar.



Scene data-block menu.

Scenes
    A list of available scenes.

Add
    New
        Creates an empty scene with default values.

    Copy Settings
        Creates an empty scene, but also copies the settings from the active scene into the new one.

    Linked Copy
        This option creates a new scene with the same settings and contents as the active scene. However, instead of copying the objects, the new scene contains links to the collections in the old scene. Therefore, changes to objects in the new scene will result in the

same changes to the original scene, because the objects used are literally the same. The reverse is also true.

Full Copy

Using this option, nothing is shared. This option creates a fully independent scene with copies of the active scene's contents. Every object in the original scene is duplicated, and a duplicate, private copy of its object-data is made as well.

Note

To choose between these options, it is useful to understand the difference between *Object* and *Object Data*. The choices for adding a scene, therefore, determine just how much of this information will be *copied from* the active scene to the new one, and how much will be *shared* (linked).

(Delete Scene)

Deletes the current scene data-block. Note, there always has to be one scene data-block.

See also

Linking to a Scene

You can link any object from one scene to another.

Scene Properties

Scene

Reference

Panel:: *Properties* ‣ *Scene* ‣ *Scene*

Camera

Used to select which camera is used as the active camera. You can also set the active camera in the 3D Viewport with `Ctrl-Numpad0`.

Background Scene

Allows you to use a scene as a background, this is typically useful when you want to focus on animating the foreground for example, without background elements getting in the way.

This scene can have its own animation, physics simulations, etc, but you will have to select it from the *Scene* data-block menu, if you want to edit any of its contents.

Background Scenes can themselves have a Background Scene (they're recursively included). So you can always make additions to existing scenes by using them as a background to a newly created scene where your additions are made.

Tip

This can also be used in combination with Linking to a Scene, where one blend-file contains the environment, which can be reused in many places.

Active Clip

Selects a Movie Clip that can be used by Motion Tracking Constraints or a camera's Background Images.

Units

Reference

Panel::	*Properties* ▸ *Scene* ▸ *Units*

Unit System

The unit system to use for user interface controls.

None::	Use units that have with no relation to the real world, practically this is the same as *Metric* just without unit names.
Metric::	Use the metric unit system in this scene.
Imperial::	Use the imperial unit system in this scene.

Unit Scale

Scale factor to use when converting between internal units and values displayed in the user interface. This can be changed when modeling at microscopic or astronomical scales.

Note

This only influences the values displayed in the user interface and not how things behave internally. For example, physics simulations don't take the unit scale into account.

Separate Units

When using *Metric* or *Imperial*, display properties as multiple values. For example, `2.285m` will become `2m 28.5cm`.

Rotation

Unit to use for displaying/editing rotation values.

Degrees::	Use degrees for angles in the user interface.
Radians::	Use radians for angles in the user interface.

Length

Unit that will be used to display length values.

Adaptive::	The unit used for a specific value depends on the magnitude of the value. For example, some values might be displayed as `23cm` while others are displayed as `10km`.
Meters/Centimeters/Feet::	A fixed unit that will be used for all lengths in the user interface.

Mass

See *Length*.

Time

See *Length*.

Temperature

See *Length*.

Imperial Length Units

Full Name	Short Name(s)	Scale of a Meter
thou	`mil`	0.0000254
inch	`"`, `in`	0.0254
foot, feet	`'`, `ft`	0.3048
yard	`yd`	0.9144

Full Name	Short Name(s)	Scale of a Meter
chain	`ch`	20.1168
furlong	`fur`	201.168
mile	`mi,m`	1609.344

Metric Length Units

Full Name	Short Name(s)	Scale of a Meter
micrometer	`um`	0.000001
millimeter	`mm`	0.001
centimeter	`cm`	0.01
decimeter	`dm`	0.1
meter	`m`	1.0
dekameter	`dam`	10.0
hectometer	`hm`	100.0
kilometer	`km`	1000.0

Full Name	Short Name(s)	Scale of a Meter

Gravity

Reference

Panel:: *Properties* ▸ *Scene* ▸ *Gravity*

Options to control global gravity used for physics effects.

See the Physics chapter for more information.

Simulation

Simulation Range
  Use a simulation range that is different from the scene range for Simulation Nodes that do not override the frame range themselves.

Start, End
  The frame at which the simulation starts/ends.

Keying Sets

Reference

Panel:: *Properties* ▸ *Scene* ▸ *Keying Sets*

See Keying Sets.

Audio

Reference

Panel:: *Properties ‣ Scene ‣ Audio*

Options to control global audio settings. To control how sounds is played back from within Blender, see the audio settings in the Preferences.

Volume
    Volume for the scene.

Distance Model
    Changes how the sound attenuation is calculated based on the distance. Most physically correct is the *Inverse* model, but it's also possible to choose a linear and an exponential falloff. The clamped modes limit the volume to be lower than 100% (1.0), that means if the distance is smaller than the reference distance, the volume is always 100%. For an exact description of each option see the OpenAL documentation.

Doppler Speed
    Speed of the sound for the Doppler effect calculations. The typical value is 343.3 m/s in air, in water for example this value is around 1560 m/s.

Doppler Factor
    Controls how strong the Doppler effect is. You can exaggerate or attenuate the change of pitch, but physically correct is a factor of 1.0.

Update Animation Cache
    Updates the audio animation cache. This is useful if you start noticing artifact in the audio.

Rigid Body World

Reference

Panel:: *Properties ‣ Scene ‣ Rigid Body World*

The *Rigid Body World* is a group of rigid body objects, which holds settings that apply to all rigid bodies in this simulation.

See Rigid Body World for more information.

Objects

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- Object Types
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Introduction

The geometry of a scene is constructed from one or more objects. These objects can range from lights to illuminate your scene, basic 2D and 3D shapes to fill it with models, armatures to animate those models, to cameras to take pictures or make video of it all.

Each Blender object type (mesh, light, curve, camera, etc.) is composed from two parts: an *Object* and *Object Data* (sometimes abbreviated to “ObData”):

Object

Holds information about the position, rotation and size of a particular element.

Object Data

Holds everything else. For example:

Meshes::	Store geometry, material list, vertex groups, etc.
Cameras::	Store focal length, depth of field, sensor size, etc.

Each object has a link to its associated object-data, and a single object-data may be shared by many objects.